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DISCUSSION PAPER SERIES

IZA DP No. 17111

**The Micro and Macro Economics
of Short-Time Work**

Pierre Cahuc

JULY 2024

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Sciences Po, IZA and CEPR

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ABSTRACT

The Micro and Macro Economics of Short-Time Work*

This article provides an overview of the economic literature on short-time work. It presents the main characteristics of short-time work since its emergence in Germany in the 1930s. It analyzes its effectiveness as a job preservation mechanism, drawing on theoretical models and empirical studies. It concludes by highlighting the areas that future research could explore to address the most significant gaps in our understanding of short-time work.

JEL Classification: J23, J41, J63

Keywords: short-time work, furlough, employment, working hours

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1 Introduction

Short-Time Work (STW) programs are government initiatives aimed at preserving employment within companies temporarily facing economic difficulties. Through STW, employees maintain employment at reduced hours, receiving a portion of their usual wage augmented by the program. Although wages during STW periods generally fall below usual salaries, they surpass typical unemployment benefits. The financial burden of supplementing income under STW is shared between the employer and the government.

STW was introduced as early as the 1920s in Germany and has been gradually adopted by other countries, particularly in continental Europe. It gained increased prominence during the Great Recession of 2008-2009, during which 25 OECD countries utilized it, and 7 introduced it among them. The very slight increase in unemployment in Germany, combined with the use of “kurzarbeit” (the German STW scheme) during the Great Recession, sparked a renewed interest in this type of intervention. This resurgence in attention is illustrated by a column by Paul Krugman published in the *New York Times* in 2009, where he wrote: “In Country A, employment has fallen more than 5 percent, and the unemployment rate has more than doubled. In Country B, employment has fallen only half a percent, and unemployment is only slightly higher than it was before the crisis. Don’t you think Country A might have something to learn from Country B?” The answer was a clear ‘yes’ and Country B was Germany who “came into the Great Recession with strong employment protection legislation. This has been supplemented with a “short-time work scheme,” which provides subsidies to employers who reduce workers’ hours rather than laying them off. These measures didn’t prevent a nasty recession, but Germany got through the recession with remarkably few job losses.” In this chapter, we will see that this enthusiasm should be assessed in light of the studies that have highlighted other factors contributing to Germany’s strong performance during this period.

STW experienced another expansion in many countries during the Covid-19 pandemic, where the proportion of workers covered by STW reached historical levels, going up to 35% at the peak of the recession, in May-June 2020, in France (OECD 2021). Such levels were unparalleled compared to those in the past, which could be close to 5%. However, during the Covid-19 pandemic, OECD countries exhibited a wide range of approaches to STW, highlighting questions about the efficacy of each country’s strategic decisions during this period. In particular, the response of continental European countries stood out due to their intense utilization of STW schemes. The unprecedented use of this mechanism

underscores its deep integration within their strategy for managing economic crises. The situation was markedly different across the Atlantic. The United States, resorting to STW only sparingly, encountered a sharp rise in unemployment. But this surge was quickly mitigated, as the majority of the sudden spike in unemployment was due to temporary layoffs, a significant proportion of which resulted in rehires (Hall and Kudlyak, 2022). This raises the question of the relevance of using STW.

STW programs can be justified by the inefficiencies associated with job destruction. Job destruction decisions are socially efficient if they result in the elimination of jobs whose social value is negative. The social value of a job includes not only the gains for the employer and the worker but also those for the community, particularly through the impact on public finances, on competing businesses, on crime, and on the quality of social relations. The operation of the economy is such that job destructions often have multiple reasons to be socially inefficient. Employers generally do not take into account all the externalities induced by their decisions. Financial constraints may force them to destroy jobs that could be profitable in the long term. Conversely, very stringent employment protection regulation may compel them to retain workers who could be more productive in other companies.

Evaluating the effectiveness of STW programs requires assessing to what extent, and at what cost, STW prevents socially inefficient job destruction. This evaluation reveals two distinct conceptual challenges.

The first challenge concerns assessing the gains achieved following the job destructions avoided thanks to short-time work, compared with the cost of this measure. It is necessary to consider all the gains and costs. Therefore, a comprehensive assessment of STW's effectiveness must consider direct participant benefits and broader economic effects. STW immediately relieves income loss for employed workers and helps firms conserve their specific human capital during temporary downturns and liquidity challenges. Such preservation aids companies by lowering recruitment costs upon recovery and reducing social costs associated with unemployment. It also results in benefits for society as a whole by limiting the negative consequences of unemployment. Nonetheless, STW poses potential drawbacks: the subsidization of hours not worked might inadvertently decrease work hours for employees not at risk of job loss otherwise, especially if hours of work and firms performance are challenging to verify. STW risks keeping employees tethered to low-productivity firms, curtailing better career prospects and stifling the shift of labor to more productive sectors. The program's impact also heavily depends on the institutional backdrop. For instance, if unemployment benefits are generous and permit earnings from short-term or part-time work, STW's financial relief might only be

marginal.

The second challenge concerns the possibility to rely on alternative income protection and employment promotion strategies, which may be more effective than STW, depending on the circumstances. Enhancing unemployment benefits could protect against income losses while still motivating job searches in dynamic sectors. Additionally, incentivizing companies to maintain their workforce through an experience-rated unemployment insurance financing system, combined with specific lay-off policies and state-backed business loans for firms in financial distress, could offer other support framework.

Despite the nearly century-old existence of STW, economists' academic output on this topic remained sparse until recently. The initial significant studies emerged in the 1980s and 1990s, aiming to empirically document STW's impact on employment stabilization during economic downturns, relying on macroeconomic or sectoral data. Concurrently, more theoretical contributions, rooted in a normative perspective, analyzed the pros and cons associated with integrating STW into unemployment insurance. The academic output significantly grew post the Great Recession. The increased reliance on STW during this period, coupled with improved data accessibility, spurred empirical studies evaluating STW's impact. The Covid-19 pandemic provided an additional boost. This article presents the contributions and discusses the limitations of this academic output.¹

Section 2 is devoted to describing the main features of various STW arrangements, tracing the history of their adoption and their distinctions from other workforce retention mechanisms. Section 3 presents the STW utilization rates, emphasizing the difference in STW utilization across recession periods and non-recession periods, the influence of labor market institutions, and administrations' capacity to manage highly complex arrangements. Theoretical models analyzing STW's impact and its integration with unemployment insurance are introduced in Section 4. The various implications of STW, sporadically analyzed by theoretical models, will enable us to discuss STW's efficiency, considering the institutional context and the existence of other insurance mechanisms in Section 5. Empirical studies dedicated to STW's impact at the macroeconomic level, company level, and individual trajectories are respectively presented in Sections 6, 7, and 8. Section 9 concludes by highlighting the areas that future research should explore to address the most significant gaps in our understanding of STW.

¹Giupponi et al. (2022) and Bermudez et al. (2023) also provide recent surveys of this literature.

2 Overview of STW schemes

This section begins by describing the proliferation of STW schemes across various countries over time. It then notes that STW is not the only job retention scheme available, before outlining the key features of STW schemes implemented in different countries.

2.1 The spread of STW since the 1920s

STW was first implemented before World War II in Germany (*Kurzarbeit*, 1927) and Belgium (*Chômage temporaire*, 1933).² Its use spread progressively, in Italy in 1941 (*Cassa Integrazione Guadagni*), France in 1951 (*Activité Partielle*), Austria in 1968 (*Kurzarbeiterhilfe*), Japan (*Koyo Chosei Joseikin*) and Luxembourg (*Chômage partiel pour difficultés économiques conjoncturelles*) in 1975, Spain in 1980 (*Expediente Temporal de Regulación de Empleo*), Denmark in 1981 (*Arbejdsfordeling*), Canada (*Work Sharing*) and Switzerland (*Indemnité en cas de réduction de l'horaire de travail*) in 1982, the USA³ in 1992 (*Short-time compensation*) – See Table 1. The spread accelerated during the Great Recession of 2008-2009 and the COVID-19 recession. Before the 2008-2009 crisis, short-time work schemes were existing in 18 of OECD countries. By 2009, these schemes operated in 25 OECD countries, including most of the Continental European countries. Only 5 countries lacked such schemes: Australia, Greece, United-Kingdom, Iceland, Sweden. The countries which created new schemes during the crisis (usually at the end of 2008 or the beginning of 2009) are the Czech Republic, Hungary, Mexico, the Netherlands, New Zealand, Poland and the Slovak Republic.

The diffusion of STW schemes has therefore been significant. However, as we will see below, the take-up of STW is very heterogeneous within the group of countries which have introduced this type of system, particularly during periods of recession. This is largely due to the fact that there are other labor retention mechanisms.

2.2 STW and other workforce retention measures

STW differs from other schemes aimed at retaining the workforce in companies facing temporary difficulties. STW schemes differ significantly from furloughs, which are mandatory leaves of absence

²We list here the countries for which we found information on the first date of introduction of STW.

³The program started in 1978 in California before receiving permanent federal authorization as part of the Unemployment Compensation Amendment Act in 1992)

Table 1: Year of introduction of STW and furlough programs in OECD countries

Scheme	Implementation	Year of introduction	
		Before COVID-19	During COVID-19
Short-time work	Temporary	Czech Republic (Vzdělávací se), Hungary (ESF-financed short-time working scheme), Mexico (Programa de Empleo Temporal Ampliado), the Netherlands (Deeltijd-WW), New Zealand (Job support scheme), Poland (Guaranteed employee benefits fund), Slovak Republic (Support for maintenance of employment)	Czech Republic (Antivirus B), Hungary (Job protection wage subsidy), Lithuania (Wage subsidies during idle hours), Sweden (Korttidsarbete)
	Permanent	Austria (Kurzarbeitsbeihilfe - 1968), Belgium (Chômage temporaire - 1953), Canada (Work Sharing - 1982), Denmark (Arbejdsfordeling - 1981), France (Activité Partielle - 1951), Germany (Kurzarbeit - 1927), Ireland (Short-Time Work Support - 1950*), Italy (Cassa Integrazione Guadagni - 1941), Japan (Koyo Chosei Jiseikin - 1975), Korea (Employment retention subsidy scheme - 1995), Luxembourg (Chômage partiel - 1975), Mexico (Programa de Empleo Temporal - 1995), Norway (Permittering - 1977*), Portugal (Suspensão ou redução temporaria da prestação de trabalho - 1983), Spain (Expediente Temporal de Regulación de Empleo - 1980), Switzerland (Indemnité de réduction de l'horaire de travail - 1982), US (Short-time compensation - 1992)	
Furlough	Temporary		Denmark (Midlertidig lønkompensation), Greece (Syn-ergasia), Latvia (Diktāves pabalsts), Slovenia (Anti-Corona Law), United Kingdom (Coronavirus job retention scheme)
	Permanent	Finland (Lomautus - 2001*)	

Notes: This Table reports the year of introduction of short-time work (STW) and furlough schemes in OECD countries. The type of support is distinguished into *temporary* and *permanent*. Temporary support is defined as the limited duration of the scheme in the labor regulation. Permanent support is defined as the enduring implementation of the scheme. The existence of the program is distinguished into *Before COVID-19* and *During COVID-19*. *Before COVID-19* refers to the period before 2011. *During COVID-19* refers to the period from March to July 2020. For Mexico, the original STW program introduced in 1995 for workers of rural areas was extended in 2009 for workers of urban areas. Information *during COVID-19* for Australia, Estonia, New Zealand, Poland, and the Slovak Republic is omitted because a Wage Subsidy (WS) program was implemented during that period. For Ireland, the WS program (*Employment Wage Subsidy Scheme*) was also implemented during COVID-19. For The Netherlands, the pre-existing STW scheme was suspended during the COVID-19 period until October 2021, while a WS program was introduced (*Noodfonds Overbrugging Werkgelegenheid*). STW program's name and year of introduction in parentheses. In this notation, (*) stands for approximate year of program introduction. **Sources:** National sources; Hijzen and Venn (2011); OECD (2020, 2021).

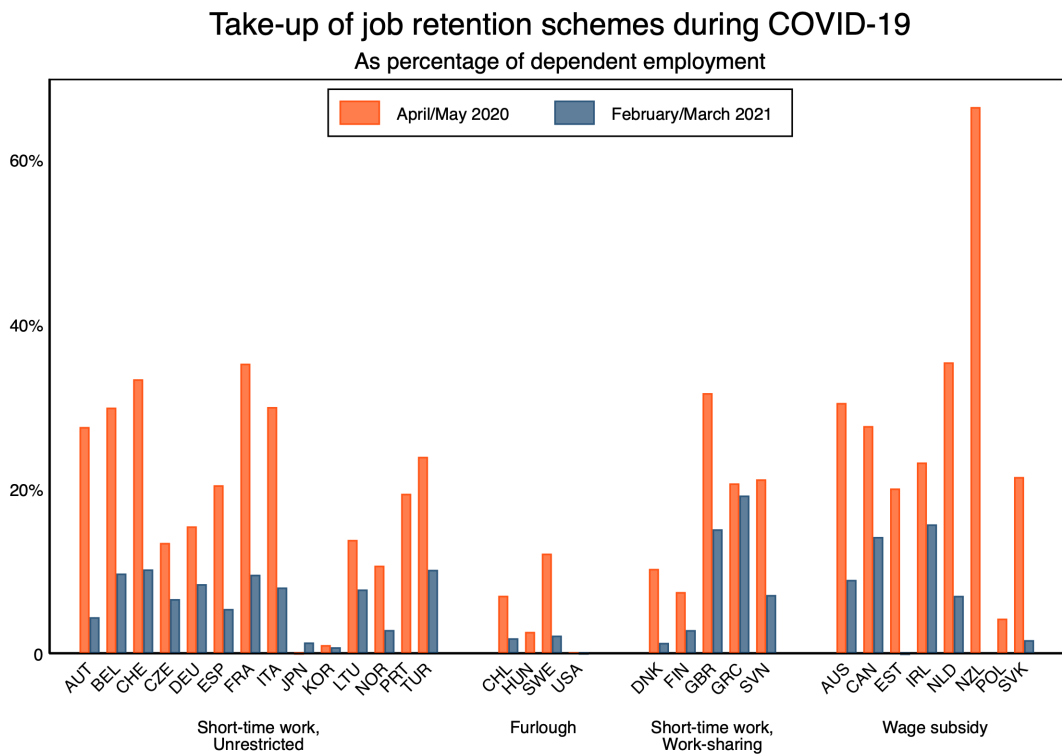
present in Denmark and the United Kingdom (Adams-Prassl et al. 2020) during the Covid-19 crisis. Unlike furloughs, which require workers to reduce their hours to zero, STW schemes primarily focus on adjusting work hours. They encourage employers to modify schedules rather than halt employment, even if only temporarily.

Temporary wage subsidies, used for instance in Australia, Canada, Estonia, Ireland, New Zealand and the Netherlands during the Covid-19 crisis, are another job retention scheme that differs from STW. These subsidy schemes not only subsidize hours worked but can also be used to top up the earnings of workers on reduced hours and are typically reserved for firms experiencing a significant decline in revenue. Figure 1 provides an overview of the use of these schemes by OECD countries during the Covid-19 crisis.

2.3 The design of STW schemes

STW schemes differ significantly in their design and regulations across countries, but they also share common features. To qualify for these programs, firms typically need to satisfy various eligibility cri-

Figure 1: OECD Job Retention Schemes during the Covid-19 crisis



Notes: This figure reports the take-up of job retention schemes in OECD countries during COVID-19, each computed as the ratio of the number of beneficiaries to dependent employment. Job retention schemes comprise “Short-time work – unrestricted” (for schemes without rules setting limits on the reduction in working time); “Furlough” (if no partial reduction in working time is allowed); “Short-time work – work-sharing” (if limits are set on the maximum reduction in working time); “Wage subsidy” (granted according to a drop in the wage bill or in business activity). Data on employment refers to 2020Q1. Figures for the months of April/May 2020 (orange) and for the months of February/March 2021 (blue). **Source:** OECD (2021).

teria which can be related to force majeure events, technical accidents, supply problems, or economic motives. In this latter case, firms must provide evidence of economic downturn, like reduced production or sales, and show that collective agreements are in place allowing for the adoption of STW. They must also either consult with their employees or obtain individual agreements.

STW programs primarily cater to firms, rather than individual workers. Traditionally, STW offers a form of retrospective compensation to these firms. Employers seek approval to access funds from the STW program, subject to certain criteria. Once approved, employers can reduce their employees' hours and make up the difference by advancing payments from their own resources. Afterward, they can claim a reimbursement from the social security system. This approach provides companies with significant flexibility. Instead of committing in advance to specific numbers or patterns of reduced hours for their workforce, employers can make decisions based on their real-time needs and report the actual figures for reimbursement afterward.

Some countries, such as Denmark, Finland, Ireland, and Spain extend STW benefits to all workers, regardless of their employment status. However, in most countries, workers must have a minimum employment contribution record to qualify for STW. This condition often excludes workers on fixed-term contracts or those working limited hours. During the Great Recession and the Covid-19 crisis, many countries eased these eligibility restrictions, especially for workers on non-permanent contracts.

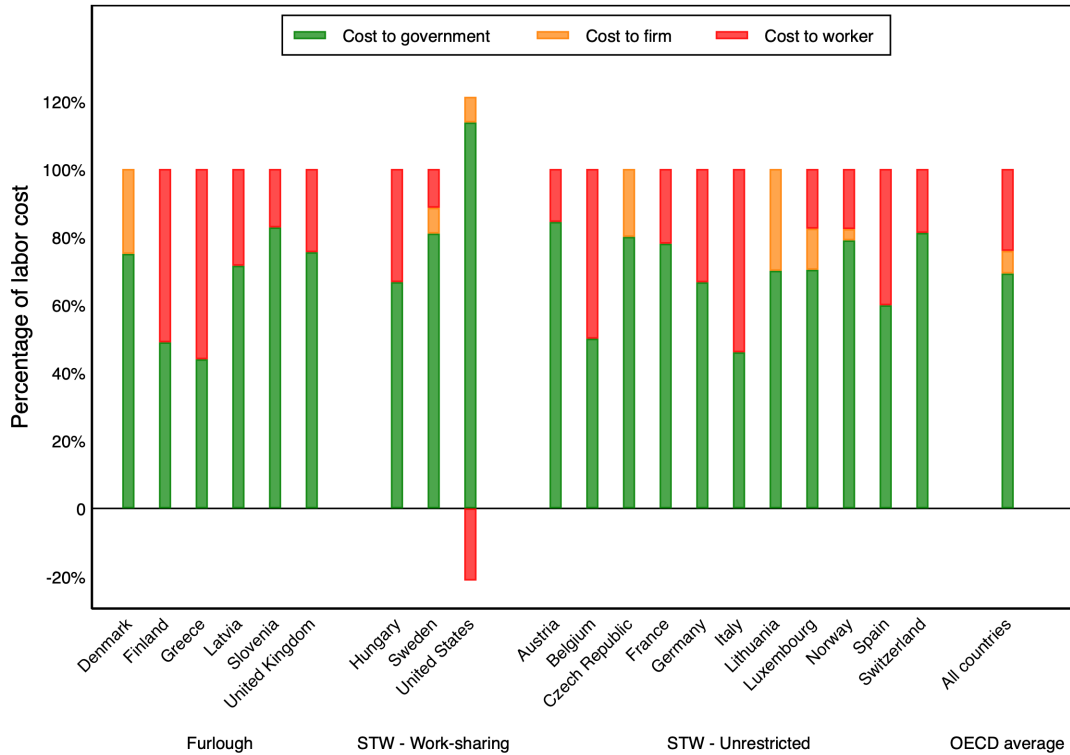
STW schemes come with certain conditions, typically requiring specific actions from both firms and employees. For instance, companies might have to commit to retaining their employees for a set period after the STW benefits cease. Additional conditions might include the need for employees to search for temporary or part-time jobs, the formulation of a recovery strategy by the firm, or the provision of training opportunities for employees.

The extent of working-hour reductions under STW is generally temporary and can be either total or partial, contingent upon the severity of the economic downturn. In countries like Germany, employers face fixed costs per worker under STW, such as social security contributions, which remain constant regardless of the number of hours worked. This structure minimizes the temptation to use STW as a fully subsidized furlough scheme with total hour reductions.

Every country has set a maximum duration for STW compensation, emphasizing its inherently temporary nature. To ensure that the system is not exploited, many countries require workers and employers to cover a portion of the compensation cost for each reduced hour. This shared respon-

sibility serves as a deterrent against misuse. As working hours decrease further from their standard level, the income generally decreases progressively in most countries. Workers can also lose social security entitlements for hours non-worked but compensated by short-time work subsidies.

Figure 2: The cost of hours not worked for the government, the firm, and the worker at the average wage level in STW and furlough schemes



Notes: : This Figure presents the costs of hours not worked for the government, the firm, and the worker across OECD countries and by different types of short-time work and furlough schemes. OECD countries retained are those with a STW program in place in May/June 2020. Three types of schemes are considered: Furlough; STW – Work-sharing; STW – Unrestricted. Furlough refers to programs that only allow for a full suspension of worker’s working time. STW – Work-sharing includes STW programs in which restriction on the worker’s maximum reduction in working time are set. STW – Unrestricted stands for STW programs with no limits on the reduction in working time. OECD average reports the average for the selected OECD countries. Costs are computed as the percentage of the labor costs, at the average wage level, for the country-specific maximum permissible reduction in working time. Information refers to the period May/June 2020. Sources: [OECD \(2021\)](#).

Figure 2 breaks down the cost of unworked hours for employers, workers, and the government within the framework of STW and furlough schemes at the onset of the Covid-19 crisis, in May-June 2020, for workers earning an average wage. On average, the cost to workers, in the form of reduced income for unworked hours, amounts to 24% of the labor cost. The income losses of workers are lower than those of workers compensated by unemployment insurance, even if the replacement ratios for unworked hours can be comparable, since workers continue to work a non-zero number of hours in the company. The average employer’s contribution is 7%. Overall, the government bears the majority

of the cost, i.e. 69%. However, the share covered by the government varies significantly from one country to another. It reaches 114% in the United States, resulting in a replacement ratio for unworked hours of 121%.⁴ The contribution of the government drops to 40% in Japan.

3 STW take-up

This section provides an analysis of the factors influencing the adoption of STW across countries, both during and outside of recession periods. It underscores the pivotal role played by labor market institutions such as employment protection regulations and the coverage of collective agreements which are related to the design and the usage of STW.

3.1 Take-up by type of workers and firms

STW aims to protect the jobs of companies subjected to temporary shocks. As such, it particularly concerns certain types of companies and workers. Its usage also varies depending on the economic situation and the institutional environment. The Wage Dynamics Network survey (WDN3), which covers a sample of about 25,000 firms in 25 European countries and ask questions about wages and employment provides interesting information about the usage of STW. WDN3 asked employers the following questions in 2014-2015: “During 2010-2013 did you need to significantly reduce your labor input or alter its composition? If YES, which of the following measures did you use to reduce your labor input or alter its composition when it was most urgent?”. Among those measures, employers can reply: “Subsidized reduction of working hours”. The responses to this survey, analyzed by [Lydon et al. \(2019\)](#), show that the STW take-up rate in European countries is significant in this post-Great Recession period when some countries are still facing an economic slowdown – see [Figure 3](#). Over a four-year period, 8.3% of companies and 11% of workers used STW.⁵ These proportions exceed 25% in Italy, which was still in recession during this period.⁶ It is much lower in countries that emerged more quickly from the recession, such as Belgium or Germany, which nevertheless have a well-established STW system.

Firms that declare that they needed to significantly reduce their labor input or alter its composition

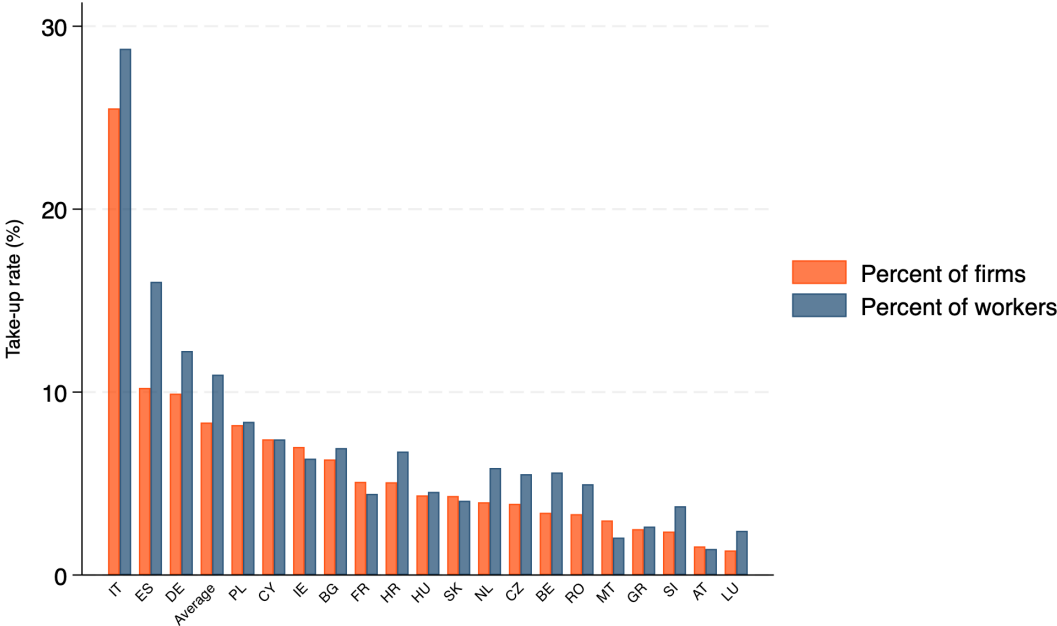
⁴This exceptional situation reflects the pandemic policy response of the U.S. government which extended the potential benefit duration from 26 to 39 weeks and more than doubled typical benefit levels, leading most unemployed workers to receive more income from unemployment than they had from their prior jobs ([Ganong et al. 2021](#))

⁵These figures represent averages across countries.

⁶See [Behavioral Finance & Financial Stability Global Crises Data by Country](#) .

use STW much more frequently than other firms – Figure 4. About 30% of these firms used it over the entire 2010-2013 period. STW is therefore a variable frequently used by companies faced with the need to reduce the amount of work they use. This proportion is particularly high in Italy, where 65% of companies declare having used it, and in Germany where this proportion reaches 43%. The WDN3 survey shows that the use of STW has an impact on employment adjustment. Lydon et al. (2019) find that firms using STW are significantly less likely to lay off permanent workers in response to a negative shock. However, this relation between STW take-up and job separation does not hold for temporary workers. Relating the STW take-up measure in the micro data to aggregate data on employment and output trends, Lydon et al. (2019) show that sectors with a high STW take-up exhibit significantly less cyclical variation in employment.

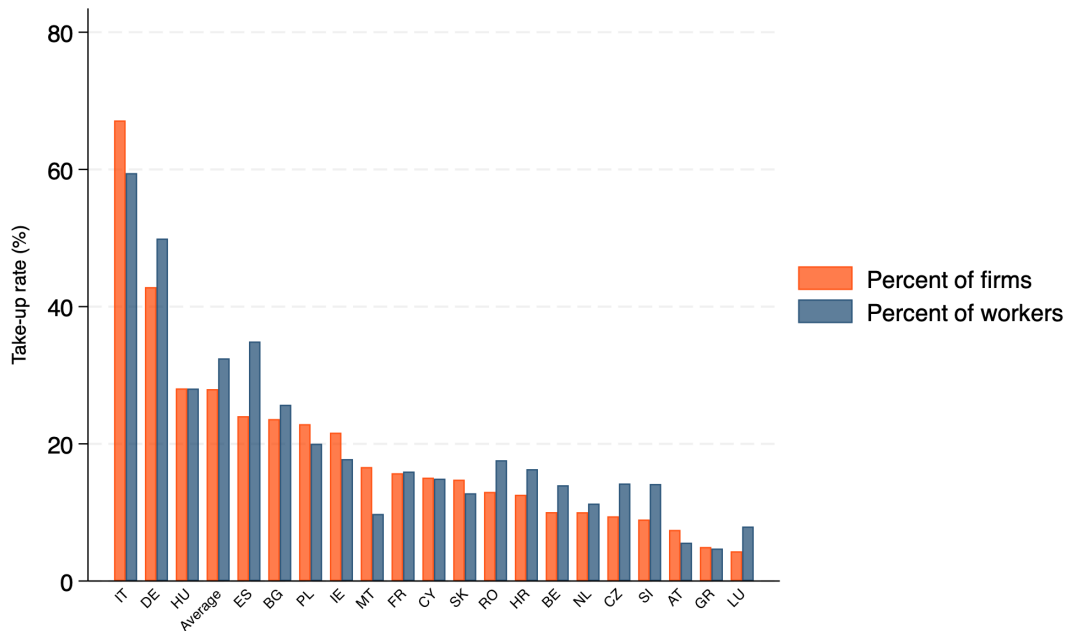
Figure 3: STW take-up rate in European countries for the period 2010-2013



Notes: This figure reports take-up rates of STW as percent of firms and percent of workers for selected countries over the period 2010-2013. Information on STW use is drawn from the third wave of the Wage Dynamics and Network (WDN) survey. For Estonia, Latvia, Lithuania, Portugal, and United Kingdom, the survey does not provide information on STW take-up. The sectors of Arts, Public sector services, and Electricity, gas and water are excluded from calculations. The percent of workers refers to the equivalent in terms of employment of those firms that are in STW. The survey does not have information on STW at the worker level. **Source:** Wage Dynamic Network, European Central Bank.

Companies in the manufacturing and construction sectors use STW more frequently as their activity is more fluctuating – see Table 2. Their usage rate is on average twice as high as that of the market services sectors. However, since these sectors represent a relatively small proportion of employment,

Figure 4: STW take-up rate in European countries for the period 2010-2013 for firms which significantly reduce their labor input or alter its composition



Notes: This figure reports take-up rates of STW as percent of firms and percent of workers for firms which significantly reduce their labor input or alter its composition for selected countries over the period 2010-2013. Information on STW use is drawn from the third wave of the Wage Dynamics and Network (WDN) survey. For Estonia, Latvia, Lithuania, Portugal, and United Kingdom, the survey does not provide information on STW take-up. The sectors of Arts, Public sector services, and Electricity, gas and water are excluded from calculations. The percent of workers refers to the equivalent in terms of employment of those firms that are in STW. The survey does not have information on STW at the worker level. **Source:** [Wage Dynamic Network](#), European Central Bank.

the proportion of companies using STW mainly comes from the services sectors. There is no systematic relationship between firm size and the use of STW when considering countries as a whole, as shown in Table 3, but this relationship varies among individual countries, as detailed in Table 4. Notably, large firms in Belgium and Germany exhibit a higher take-up of STW, although to a lesser extent compared to other countries. In contrast, in Italy, small firms demonstrate the highest take-up rate. These variations can be attributed to the specific design of each country's STW program and the sectoral composition of firms of different sizes.

Table 2: STW take-up by firms across and within sectors

	Percent of firms			Percent of workers		
	Not in STW	In STW	In STW (within sector)	Not in STW	In STW	In STW (within sector)
Manufacturing	13.7	23.3	13.4	28.1	44.1	16.2
Construction	12.7	20.3	12.7	7.0	10.0	14.9
Trade	29.0	23.4	6.8	22.1	14.7	7.5
Business services	42.7	32.6	6.5	40.4	30.7	8.5
Financial intermediation	1.9	0.3	1.6	2.4	0.5	2.7
Total	100.0	100.0	8.3	100.0	100.0	11.0

Notes: This table reports take-up rates of STW as percent of firms and percent of workers by sector of economic activity for selected countries over the period 2010-2013. Information on STW use is drawn from the third wave of the Wage Dynamics and Network (WDN) survey. The sectors of Arts, Public sector services, and Electricity, gas and water are excluded from calculations. The percent of workers refers to the equivalent in terms of employment of those firms that are in STW. The survey does not have information on STW at the worker level. The take-up rate is calculated by dividing the number of firms who have used STW at least once in the period by the average number of firms of the corresponding category.

Table 3: STW take-up by firms across and within size

	Percent of firms			Percent of workers		
	Not in STW	In STW	In STW (within size category)	Not in STW	In STW	In STW (within size category)
Less than 5 employees	45.6	47.4	8.6	4.5	3.5	8.9
5-19 employees	36.4	33.8	7.8	15.8	10.9	7.8
20-49 employees	9.4	11.0	9.6	15.3	14.3	10.3
50-199 employees	4.0	4.1	8.4	26.1	20.9	9.0
200 employees and +	4.5	3.7	7.0	38.3	50.3	13.9
Total	100.0	100.0	8.3	100.0	100.0	11.0

Notes: This table reports take-up rates of STW as percent of firms by firm size for selected countries over the period 2010-2013. Information on STW use is drawn from the third wave of the Wage Dynamics and Network (WDN) survey. The percent of workers refers to the equivalent in terms of employment of those firms that are in STW. The survey does not have information on STW at the worker level. The take-up rate is calculated by dividing the number of firms who have used STW at least once in the period by the average number of firms of the corresponding category.

Workers who resort to STW differ depending on whether the economy is in recession. Generally, workers with stable, indefinite-term employment, or those eligible for unemployment compensation,

Table 4: STW take-up by firms by firm size

Country	Firm size					Total
	Less than 5 employees	5-19 employees	20-49 employees	50-199 employees	200 employees and +	
AT	0.0%	0.5%	0.9%	3.2%	1.4%	1.6%
BE		3.4%	2.8%	5.1%	5.9%	3.4%
BG		5.6%	9.8%	2.6%	10.4%	6.3%
CY	2.1%	10.6%	23.3%	0.0%	4.4%	7.4%
CZ		3.6%	2.9%	5.5%	6.6%	3.9%
DE	9.2%	11.2%	11.4%	10.6%	14.5%	9.9%
ES		10.4%	9.3%	7.8%	18.9%	10.2%
FR		2.4%	8.9%	3.9%	22.3%	5.1%
GR		2.2%	4.2%	2.7%	2.1%	2.5%
HR		4.4%	9.6%	1.8%	8.3%	5.1%
HU		3.8%	6.5%	4.3%	4.4%	4.4%
IE	5.6%	9.4%	6.1%	6.3%	2.8%	7.0%
IT		34.7%	25.9%	22.0%	27.2%	25.5%
LU	0.8%	1.4%	3.8%	6.0%	0.0%	1.3%
MT		3.8%	1.9%	3.4%	0.0%	3.0%
NL		3.7%	4.1%	6.1%	5.4%	4.0%
PL	8.1%	8.7%	4.6%	5.5%	9.5%	8.2%
RO			2.7%	4.1%	5.9%	3.3%
SI		2.0%	2.0%	5.2%	4.2%	2.4%
SK		4.4%	3.4%	4.5%	6.1%	4.3%
Total	8.6%	7.8%	9.6%	8.4%	7.0%	8.3%

Notes: This table reports take-up rates of STW as percent of firms by firm size for selected countries over the period 2010-2013. Information on STW use is drawn from the third wave of the Wage Dynamics and Network (WDN) survey. The take-up rate is calculated by dividing the number of firms who have used STW at least once in the period by the average number of firms of the corresponding category.

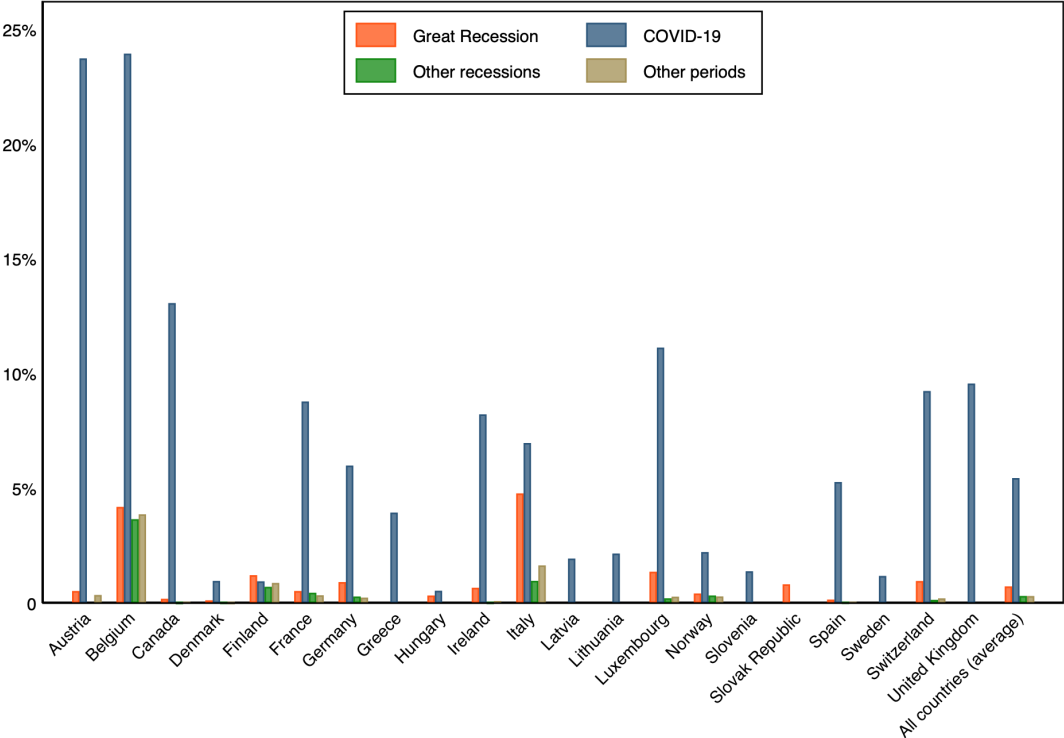
qualify for STW during regular periods. In countries like Belgium, France, or Germany, STW allows for the retention of stable workers by reducing their working hours when activity slows down, particularly due to seasonal fluctuations. Thus, under these circumstances, STW limits the use of fixed-term employment, replacing temporary jobs with permanent ones. When major recessions, such as the Great Recession of 2008-2009 or the Covid-19 recession, occur, public authorities tend to expand STW access to workers on fixed-term contracts. This expansion was observed in countries like Finland, France, and Switzerland during the Covid-19 crisis (OECD 2021, Hijzen & Salvatori 2022, Giupponi et al. 2022).

3.2 Take-up in large recessions

STW, which aims to support employment in companies facing temporary declines in activity, is intended to be used more intensively during large recessions. Outside of large recessions, the fraction of the labor force using STW is below 1% of workers in dependent employment in most countries, with the exception of Belgium and Italy – see Figure 5. The use of STW increased significantly during the

last two major recessions, reaching an unprecedented level during the Covid-19 crisis. The average annual percentage of workers who used STW during the Covid-19 crisis approached 25% in Austria, Belgium, and the United Kingdom. Comparing this to the rates during the Great Recession of 2008-2009, which were below 1% in Austria, amounted to 4% in Belgium, and none in the UK, clearly highlights the exceptional nature of the Covid-19 crisis in terms of STW usage. The STW take-up rate also grew considerably during this period compared to the Great Recession in Germany, Finland, France, and Luxembourg, where STW had been in place for several decades before the Great Recession.

Figure 5: STW take-up in large recessions and in other periods



Notes: This figure reports the average annual take-up rates over the period 2000-2022, depending on data availability for each country, according to four periods: i) Great Recession, ii) COVID-19, iii) other crises, and iv) other periods. The annual take-up rate is calculated by dividing the number of employees who have used STW at least once in the year by the average salaried employment for the year. The definition of each period for each country is based on the following sources: the [Behavioral Finance and Financial Stability Global Crises Data by Country](#) developed by the Harvard Business School is used for the period 2000-2017, [Contraction and Expansion Indicators from Federal Reserve Bank of St. Louis](#) for the period 2017-2019, information of stay-at-home restrictions from the Oxford COVID-19 Government Response Tracker ([Hale et al. 2021](#)) for the COVID-19 period. Country specific different sources are used in the case of lack of availability of information from the above-mentioned sources. The COVID-19 period is defined by years 2020 and 2021 for certain cases and years 2020, 2021, and 2022 for countries where restrictions were lifted later on. The Great Recession period also varies according to each country setting. Countries such as Estonia, Greece, Latvia, Lithuania, and Sweden have had a STW program only during the COVID-19 period. The Netherlands and Turkey are not included because of lack of information. Poland is not included given that the scheme, only available during the Great Recession, presents a take-up rate lower than 1%.

3.3 Take-up outside of large recessions

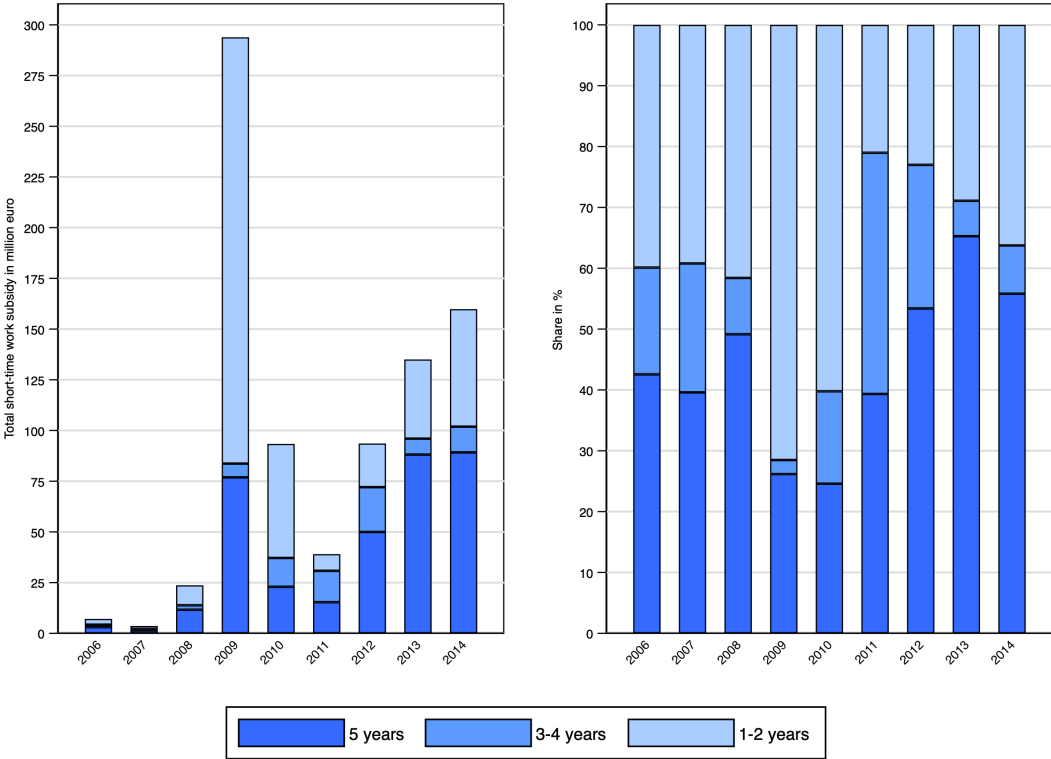
During recessions, it is predominantly businesses facing unforeseen and temporary drops in activity that benefit from STW. On the other hand, in regular times, it is often companies subject to anticipated seasonal fluctuations in activity that recurrently use STW. These companies usually belong to the manufacturing sector and are large. The difference in the reasons for using STW is illustrated in Figure 6, which shows that over 60% of the non-worked hours subsidized by STW are used by businesses that resort to it recurrently for at least three consecutive years outside of recession periods in France from 2007 to 2014. In contrast, this proportion dropped to less than 30% during the depths of the Great Recession in 2009.

In this context, STW subsidies are concentrated on large businesses. The top 1% of users, who are mostly systematic users, consumed over 50% of the short-time work hours between 2006 and 2014. These major consumers were consistently active throughout the 2008-2014 period. This focus of subsidies on a limited number of players can affect STW regulations. In France, following the Great Recession of 2009, intense lobbying by sectors that greatly benefited from STW prompted the government to increase its contributions in 2012. Consequently, this reform primarily favored a small number of large firms that rely heavily on the scheme to manage their seasonal business fluctuations. The impact of corporate lobbying on increasing government contributions to STW following recession periods is also documented, such as in Germany, where STW was phased out at the end of the Great Recession.

3.4 Take-up and labor market regulation

The use of STW is influenced by labor market regulations at both the micro and macroeconomic levels. At the microeconomic level, companies are more incentivized to use STW when layoff costs are high and when renegotiations that adjust wages downward are less frequent. Lydon et al. (2019) show that companies facing higher layoff costs more often opt for an adjustment in hours by resorting to STW when their activity decreases. They also find that firms with a higher proportion of long-tenured workers, whose dismissal costs are typically high, are more likely to resort to STW: a ten percentage point increase in the share of workers with five or more years working in the firm increases the likelihood of STW take-up by 0.6 to 0.9 percentage points. The presence of unions in the company also promotes the use of STW. This can be related to the employer's ability to better share information with workers thanks to the union, especially for filing a request for access to STW with the administration.

Figure 6: Decomposition of public expenditure for STW according to the extent of regular use in France.



Notes: This figure breaks down the public expenditure for STW according to the type of user company from 2006 to 2014 in France. “5 years” represents systematic users using short-time work every year over the last 5 years; “3 to 4 years” represents repeated users using short-time work 3 to 4 years over the last 5 years; “1 to 2 years” represents occasional users using short-time work 1 to 2 years over the last 5 years. **Source:** Cahuc & Nevoux (2018).

But it can also be due to collective agreements negotiated by unions, which limit wage adjustment and external flexibility (Biancardi et al. 2022).

At the macroeconomic level, STW schemes are often more prevalent in countries with rigorous employment protection regulations, as indicated by the OECD employment protection index – see Figure 7 – and higher coverage of collective bargaining – see Figure 8.

The correlation between STW, on one hand and job protection and collective bargaining coverage on the other hand, underscores a regulatory balance between internal and external flexibility. Countries that prioritize internal flexibility tend to have robust employment protection measures and high collective bargaining coverage paired with comprehensive STW schemes. In contrast, those emphasizing external flexibility typically have lax employment protection, lower collective bargaining coverage and less STW utilization. Internal flexibility is particularly beneficial for employees on permanent contracts, who are protected by employment protection legislation. In this regard, STW may contribute to increasing labor market segmentation. Like employment protection, it can partly reflect the ability of insiders to protect their jobs through regulation.

STW does not only have the effect of reinforcing the impacts of employment protection on the job stability of permanent workers. The adoption of rules favoring STW can also limit company failures in countries where employment protection is strict. Indeed, high dismissal costs that make downward employment adjustments expensive can lead companies facing a reduction in their activity to bankruptcy. This mechanism was analyzed by Samaniego (2006) and Koeniger & Prat (2007), who find that higher firing costs increase firm destruction and workforce turnover more if exiting firms default on firing costs. In this context, resorting to STW, by temporarily reducing costs, can promote company survival. This reason for resorting to STW can lead public authorities to favor STW if many companies can be in default due to large-scale negative macroeconomic shocks, such as the Covid-19 pandemic.

3.5 STW design and administrative capacity

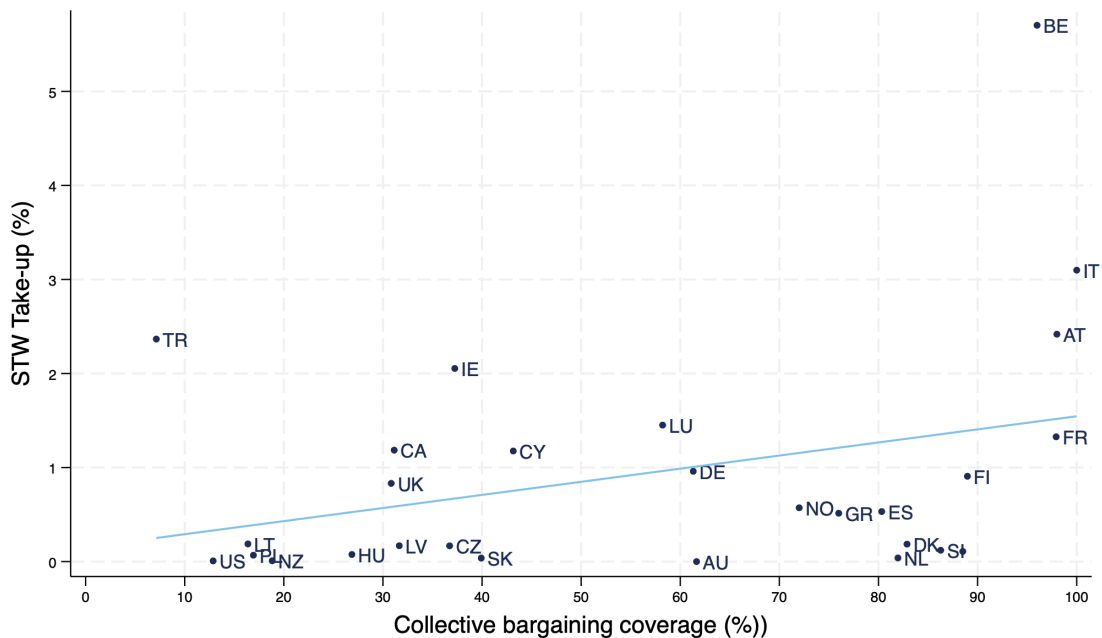
Boeri & Bruecker (2011), Cahuc & Carcillo (2011), Hijzen & Martin (2013) examine the features of STW systems correlated with its usage rate during the Great Recession using quarterly OECD data collected by Hijzen & Venn (2011). This dataset encompasses indicators highlighting the primary attributes of STW schemes across four essential dimensions: work-sharing, eligibility, conditionality, and generosity. The work-sharing dimension delineates the allowable reductions in weekly hours for short-time workers. Eligibility criteria define the prerequisites that both employers and workers need to fulfill to

Figure 7: STW take-up and EPL for regular and temporary contracts.



Notes: This figure displays the relation between the index of Employment Protection and the take-up rates of STW programs for selected countries. The index of Employment Protection, sourced from OECD statistics (version 3), is equal to the sum of the indexes for regular and temporary contracts. For OECD statistics and take-up rates, values are averages over the years 2000-2022. **Source:** OECD for EPL and various sources for STW take-up.

Figure 8: STW take-up and collective bargaining coverage.



Notes: This figure displays the relation between the collective bargaining coverage and the take-up rates of STW programs for selected countries. Values are averages over the years 2000-2022. **Source:** OECD for collective bargaining coverage and various sources for STW take-up.

engage in STW programs. The conditionality aspect outlines behavioral expectations for all participants in STW schemes. Lastly, a programme’s generosity aspect gauges the participation cost for both companies and employees, as well as the maximum duration of their involvement.

The take-up is positively correlated with the permissible reductions in weekly working hours that can be compensated, with the scheme’s maximum duration, and with the proportion of labor cost for reduced hours that is subsidized. There is evidence suggesting that when firms are required to share in the STW cost, the take-up’s responsiveness to output shocks diminishes. Take-up rates do not seem to be influenced by stringent conditions to qualify for STW compensation, such as a commitment to retain employees for a specified period post-compensation, job search mandates, the creation of a recovery plan, or employee training. It is possible that these conditions, despite their intentions, do not significantly impact outcomes due to challenges in enforcement.

The uptake rate of STW is primarily affected by an administration’s capacity to process requests from companies experiencing temporary shocks. This capability influences several factors: the processing time of company requests, the delay in reimbursement for wages paid by companies and later reimbursed by the administration —as is typical in most countries— and the timing of direct wage

payments by the administration for unworked hours, which is observed in Belgium, Finland, Hungary, Norway, Spain, Turkey, and the United States(OECD 2021)j.

The consequence of the administration's functioning on the approval and take-up rate is documented by Kopp & Siegenthaler (2021) and Cahuc et al. (2021). They highlight the extent of the heterogeneity in the approval rate of companies' STW applications between local administrations that are supposed to apply the same national rules during the Great Recession of 2008-2009. Kopp & Siegenthaler (2021) argue that the vague formulation of the eligibility criteria and the absence of clear instructions on their implementation left substantial discretionary scope for the cantonal employment agencies in Switzerland. This scope is reflected in cantonal differences in approval rates, ranging from 55% to 100%. Kopp & Siegenthaler (2021) show that these differences are persistent and cannot be entirely explained by the characteristics of the establishments that apply. Cahuc et al. (2021) demonstrate that the decentralized administration of short-time work leads to significant differences in approval rates across French départements, with rates varying from 45 to 100 percent in 2008. They assert that a low approval rate is indicative of poor administrative management. To gauge the quality of this management, they use an indicator of administrative inconsistency from 2007-2008. Specifically, some firms initially had their applications denied but were approved upon reapplication. The approval rate is negatively correlated with both the average number of short-time work application refusals that are later overturned and with the proportion of applications where the response time exceeds 14 workdays. Put simply, longer administrative delays and more frequent reapplications (due to initial rejections) suggest a more burdensome and less efficient administrative process. Cahuc et al. (2021) show that poor management quality decreases the STW take-up.

4 The theoretical models of STW

Early theoretical models explored the consequences of STW from a normative perspective. They aimed to assess its effectiveness in promoting a better distribution of job loss risks when job destruction is inefficient. These reflections led to mixed conclusions: while STW can correct inefficient separations, it may do so at the expense of excessively reducing working hours. Subsequent research analyzed the impact of STW on firms and workers behaviors to better understand, from a positive perspective, its effects on employment and working hours.

4.1 Normative approach

Part of the literature analyzes the effectiveness of STW from a normative standpoint within the framework of implicit contract models in which firms offer employment contracts that insure risk-averse workers against random variations in productivity (Rosen 1985). In this context, the presence of unemployment compensation combined with the absence of contractual severance pay can lead to inefficient separations. Burdett & Wright (1989) showed that STW can reduce these inefficient separations. However, while STW schemes correct some of the inefficiencies of the traditional unemployment insurance systems by bringing back efficient levels of employment, they are also often likely to lead to inefficient levels of working time. Indeed, the subsidy for unworked hours encourages substituting leisure for consumption, which reduces working hours. Thus, in theory, STW has an undetermined impact on the total volume of working hours and production.

Another part of the literature analyzes the effectiveness of STW within the framework of models of optimal taxation. One potential advantage of STW for public finances is that it can help preserve jobs that are at risk of being destroyed. By conditioning subsidies on reduced working hours, STW supports firms with jobs the most at risk of destruction but with recovery potential. For this reason, STW schemes often forego a strict economic justification. When justification is provided, it tends to be informal, not anchored to a quantitative threshold, or it may sometimes mandate a minimum hours reduction (OECD 2021). Teichgräber et al. (2022) develop a model of job retention policies in which the social planner cannot observe which jobs are truly at risk of destruction because the productivity of job is not verifiable. In this context, assuming that hours of work are verifiable, hour reductions of short-time workers act as a screening mechanism to mitigate the adverse selection problem, which provides a rationale for STW. Compared to alternatives like wage or hiring subsidies, short-time work stands out as an efficient tool to support employment. This conclusion, however, is based on the assumption that the hours worked can be perfectly verified by the administration. In reality, administrative checks are very costly, especially since the hours worked are generally reported only ex-post, which may increase moral hazard problems as employers can use STW as a wage subsidy without implementing any hour reduction (Bossler et al. 2023).

4.2 Positive approach

The literature that analyzes the impact of partial unemployment schemes on employment and working hours from a positive perspective generally fits into a dynamic context in which STW aims to preserve employment for companies facing temporary shocks. [Albertini et al. \(2022\)](#), [Balleer et al. \(2016\)](#), [Cooper et al. \(2017\)](#), [Gehrke et al. \(2019\)](#), [Lydon et al. \(2019\)](#), [Gehrke & Hochmuth \(2021\)](#), [Dengler & Gehrke \(2022\)](#), [Giupponi & Landais \(2023\)](#), [Tilly & Niedermayer \(2017\)](#) analyze this problem within the framework of job search and matching models à la [Mortensen & Pissarides \(1994\)](#).

The assumptions about the determination of hours and wages vary according to the various contributions. [Tilly & Niedermayer \(2017\)](#) assume that firms unilaterally choose working hours and offer non-negotiable contracts that stipulate a fixed hourly wage to workers who can search for work on-the-job. [Balleer et al. \(2016\)](#), [Dengler & Gehrke \(2022\)](#), [Gehrke et al. \(2019\)](#), [Lydon et al. \(2019\)](#) assume that firms choose working hours while wages are negotiated. [Cahuc et al. \(2021\)](#) assume that wages and working hours are negotiated. [Albertini et al. \(2022\)](#) assume that wages depend on productivity with a lower bound equal to the minimum wage, while working hours are set by employers. [Giupponi & Landais \(2023\)](#) assume that wages and hours are functions of productivity and that employers choose the number of hours worked that benefit from STW when they use it.

The main predictions of these approaches can be summarized in a simple model that represents the evolution of the value of a job, assuming that wages and working hours are negotiated. The model considers an infinite horizon and discrete time, where each working hour produces a quantity A . It is assumed that A is observed by both the firm and the worker, but not by the government, which only observes the hours of work. At the beginning of each period, A is known, but its value changes randomly between periods. The worker's preferences are represented by a function equal to the sum of the wage and the disutility of working hours, h , equal to $\phi(h)$, where ϕ is an increasing and convex function. If the worker loses his job, his expected discounted utility is equal to U . U depends notably on unemployment compensation and the probability of finding another job. The firm must pay a dismissal cost to separate from the worker, and the value of employment for the firm is null after the separation, because the job is vacant or is destroyed. Therefore, in the event of separation, the worker obtains U and the firm an expected gain equal to $-F$, where F denotes the dismissal cost, assumed to be a red-tape cost. The STW scheme allows benefiting from a subsidy σ for each hour not worked below the threshold H . This threshold often corresponds, in fact, to the usual working duration

stipulated in the employment contract.

In this context, the value for the firm of a job with h working hours and productivity A , denoted by $\Pi(A, h)$, is defined by the following Bellman equation

$$\Pi(A, h) = Ah - wh + \beta \mathbb{E} [\max [\Pi(A', h), -F]]$$

where $\beta > 0$ is the discount factor, \mathbb{E} the expectation operator, and A' the value of A in the following period.

The value of this job for the worker, denoted by $W(A, h)$, satisfies:

$$W(A, h) = wh - \phi(h) + \sigma \max(H - h, 0) + \beta \mathbb{E} [\max [W(A', h), U]]$$

By definition, the surplus of this job

$$S(A, h) = W(A, h) - U + \Pi(A, h) + F$$

Using the definitions of $W(A, h)$ and $\Pi(A, h)$, the surplus of the job is defined by the following equation

$$S(A) = \max_h Ah - \phi(h) + \sigma \max(H - h, 0) - U + F + \beta \mathbb{E} [\max [S(A'), 0]] \quad (1)$$

When working hours and wages are negotiated, working hours maximize the surplus and the wage results from a surplus-sharing rule, which generally corresponds to the Nash solution to the negotiation problem. Employment is destroyed when the surplus is negative. Assuming, for illustrative purposes, that the function ϕ is quadratic: $\phi(h) = h^2/2$, the working hours that maximize the surplus satisfy

$$h^* = \begin{cases} A & \text{if } A \geq H \\ \max(A - \sigma, 0) & \text{if } A < H \end{cases} \quad (2)$$

This equation illustrates a first result. It shows that firms and workers use STW if labor productivity is low. More precisely, they use STW for jobs where labor productivity is below a threshold that depends on H , the threshold of hours below which non-working hours are compensated by STW. In our example, equation (2) indicates that this productivity threshold below which it may be of interest

to use STW is simply equal to H . This result is illustrated on the left panel of Figure 9 which shows that the hours of work, h^* , increase with the productivity parameter A and are lower by the amount σ when STW is used.

The STW also has an impact on job destruction. The surplus for the optimal value of h defined by equation (2) is expressed as:

$$S(A) = \frac{1}{2}A^2 + \sigma \max(H - A, 0) - U + F + \beta \mathbb{E} [\max[S(A'), 0]] \quad (3)$$

This expression shows that the surplus grows with the productivity parameter A , when the subsidy σ is sufficiently small, which we will assume for the sake of realism. This implies the existence of a reservation productivity, for which the value of the surplus is equal to zero, below which jobs are destroyed.

The reservation productivity is reduced in the case of recourse to STW, since the surplus (3) is increased by the term $\sigma(H - A)$ when the unworked hours below H are subsidized, as illustrated by the left panel of Figure 9. The following results can be deduced:

First, STW, by increasing the value of jobs, reduces their destruction rate. Destruction is reduced due to the effective use of STW in the current period for subsidized employment. It is also reduced thanks to the positive impact of STW on anticipated future gains, $\mathbb{E} [\max[S(A'), 0]]$, even in periods when STW is not used, since the reservation productivity depends on these anticipated gains. For the same reason, STW has a positive effect on job creation.

Secondly, STW reduces the working hours for all jobs whose productivity is between the reservation productivity in the case of recourse to STW – denoted R_σ in Figure 9 –, and H . However, some of these jobs are not destroyed in the absence of STW. Indeed, jobs whose productivity is between the reservation productivity in the absence of recourse to STW (i.e. when $\sigma = 0$), denoted R , and H are not destroyed without the use of STW, because the job surplus with STW is positive for these values – see Figure 9. Since STW can only be used if $R < H$ (otherwise it is preferable to destroy jobs whose productivity is less than H), this shows that STW can only save jobs if there is a portion of jobs using STW that would not have been destroyed if they had not used it. Workers occupying these jobs work fewer hours than if they had not used STW. This consequence of STW has been highlighted by the first contributions dedicated to STW from a normative perspective (Burdett & Wright 1989).

Until now, we have considered the case where H , the threshold number of hours of work below

which non-worked hours are subsidized, ensures that there exists values of productivity for which it is worth using STW. However, the existence of this case depends on the values of the STW parameters, σ and H , and of the other parameters. The right panel of Figure 9 represents the situation where it is preferable to eliminate the job rather than resort to STW when productivity is too low. In this situation, the employment surplus is negative for values of productivity A greater than H .

The expression (3) of the surplus provides information on the circumstances in which this situation can occur.

First, the reservation productivity increases with U , the worker's expected utility in the event of separation. Thus, when workers have good external opportunities, it is preferable to destroy the job rather than reduce working hours. This model therefore predicts that the use of STW is less likely when unemployment is low, as workers then have better opportunities. It also predicts that the use of STW increases during a recession not only because productivity decreases, but also because workers' external opportunities are degraded.

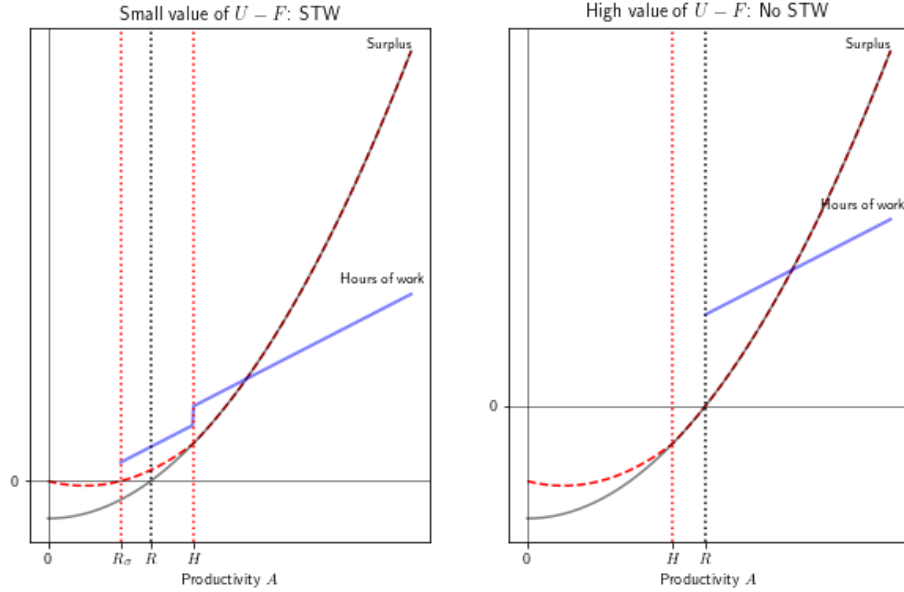
Second, the reservation productivity R decreases with $\mathbb{E}[\max[S(A'), 0]]$, the expectation of future gains. This expectation of future gains is higher when negative shocks are less persistent. Consequently, this model predicts that the use of STW is more likely when negative shocks are less persistent, because in this case the reservation productivity is lower and therefore more likely to be less than H . This can be an advantage of STW, which encourages firms to retain jobs whose present value is high enough, and to destroy those whose prospects are too degraded. As we will see below (Section 5.2.2), this property of STW is often cited to justify its effectiveness relative to wage subsidies independent of working hours.

Third, the reservation productivity decreases with the dismissal costs F , which implies that the use of STW is more likely when the dismissal costs are higher. This prediction is consistent with the empirical facts, since it is observed that firms facing higher labor adjustment costs use STW more (Lydon et al. 2019).

Search and matching models are also used to analyze the consequences of STW on job reallocation. To the extent that STW encourages companies to save jobs with low productivity, STW can slow down the reallocation of workers and capital towards more productive jobs. In search and matching models, this phenomenon arises from the fact that retaining workers in firms increases labor market tightness, which discourages job creation (Albertini et al. 2022, Balleer et al. 2016, Cooper et al. 2017, Giupponi & Landais 2023, Diaz et al. 2023). The magnitude of this phenomenon is, however, difficult to empirically

evaluate from this type of approach, as it is very sensitive to the modeling choices of the production function, preferences, and the matching function between vacant jobs and job seekers.

Figure 9: Hours of work and value of jobs with and without STW use



Notes: This figure displays the hours of work and the value of the job surplus with and without STW use. The horizontal axis is the level of labor productivity A . The thick continuous blue line displays the hours of work. The continuous black curve represents the value of the surplus when the firm does not use STW in the current period, and the dotted red curve represents the value of the surplus when the firm can use STW. When productivity is above the threshold H , it is optimal not to use STW, and the value of both surpluses is identical. When productivity is below H , the left graph shows that the value of the surplus is higher when STW is used. This implies that the reservation productivity, below which employment is destroyed, is smaller with STW (equal to R_σ) than without STW (equal to R). The situation described in the left graph can exist if $U - F$ is small enough for R to be less than H , meaning if the worker's external opportunities are weak or if the dismissal costs are high. Otherwise, as represented by the right graph, it is optimal to destroy the job rather than resort to STW when A is small. This figure is constructed with $\phi(h) = h^2/2$, $\sigma = 0.5$, $H = 2$, $U - F - \beta \mathbb{E}[S(A')] = 1$ for the left hand side panel and equal to 3 for the right hand side panel.

From the review of theoretical literature on STW, it is clear that existing knowledge is inadequate to pinpoint the key parameters that would define an optimal STW scheme coordinated with unemployment insurance. However, insights gleaned from the theoretical models, though informal, can be useful in assessing the effectiveness of STW in varied contexts.

5 The efficiency of STW

The justification of STW from an economic analysis standpoint remains an open question, with responses that are contingent upon the context. One primary reason is that it is very difficult to assess

the gains induced by job destructions avoided by STW for society as a whole. Another reason is that the market failures or the inefficiencies of public interventions that STW can address can be corrected by other tools, which can be more effective. For instance, STW can be justified by the inefficiency of employment termination decisions tied to the fiscal and social externalities highlighted by [Feldstein \(1976\)](#). However, an experience rating system for unemployment insurance financing is generally more effective in achieving this goal, as it does not lead to reduced working hours ([Burdett & Wright 1989](#), [Blanchard & Tirole 2008](#), [Cahuc & Zylberberg 2008](#)). Furthermore, the downward adjustments in working hours facilitated by STW can also be achieved through partial unemployment benefits, found in many unemployment insurance systems ([Boeri & Cahuc 2023](#)). Company liquidity issues combined with downward wage rigidity can lead to socially inefficient job losses that could justify the use of STW ([Giupponi & Landais 2023](#)). However, a system of state-guaranteed business loans can better target companies facing liquidity shortages. STW can be justified by its positive effects on aggregate demand ([Balleer et al. 2016](#)). But it is more efficient to transfer resources to the unemployed, who have lower incomes and whose marginal propensity to consume is higher than that of salaried workers. One potential advantage of STW for public finances is that, by conditioning subsidies on reduced working hours, STW supports firms with jobs the most at risk of destruction but with recovery potential. STW can thus help target subsidies towards the companies facing the most temporary difficulties. However, the moral hazard arising from the possibility of declaring unworked hours, which is costly for the administration to verify, limits the effectiveness of STW ([Bossler et al. 2023](#)). Subsidies conditioned on companies' performance indicators might be more suitable for targeting those facing temporary negative shocks.

These observations indicate that the consequences of STW must be assessed based on the context, that is, the set of institutions and the other policy tools of the country in question. To understand how STW programs integrate into this analytical framework, it is beneficial to explore the determinants of the Marginal Value of Public Funds (MVPF) in the context of STW. It is an analytical framework that allows for the consideration of STW's impact on its direct beneficiaries as well as on society as a whole and is also suitable for comparing the effectiveness of different policies. The Marginal Value of Public Funds (see [Hendren \(2016\)](#) for an extensive presentation and [Hendren & Sprung-Keyser \(2020\)](#), for applications) measures the impact of expenditures dedicated to a policy on social well-being W

defined as the weighted sum of individual utility functions

$$W = \sum_i \psi_i U_i$$

where ψ_i represents the social weight of individual i for policy j . The public expenditure, denoted by E_j , is a function of the policy parameters. In this context, the Marginal Value of Public Funds is equal to the ratio between the weighted sum of individual willingness to pay⁷ for policy j divided by the net public cost of the policy:

$$dW = \frac{\text{Weighted Sum of Willingness to Pay}_j}{\text{Net public cost}_j} dE_j \quad (4)$$

The net public cost is equal to the sum of the direct cost at unchanged behaviors, called the mechanical cost, and the indirect cost, called the behavioral cost, resulting from the modification of behaviors induced by the policy. In the case of STW, the behavioral effects notably include the reaction of work hours and employment. The behavioral cost can be positive if it increases spending, but also negative, if it reduces it. For example, if STW preserves many jobs, it may allow for savings thanks to the reduction of unemployment compensation expenses and the additional tax paid on the wages of the preserved jobs.

The expression (4) of the impact of public policy on social welfare is useful for analyzing the effects of STW. It provides a measure to compare the effectiveness of different policies while distinguishing their consequences on the well-being of individuals and public spending. The numerator illustrates the impact of STW by considering the direct effects, on those who use short-time work, and indirect effects on non-users. This assessment hinges on individual preferences, but also on social preferences, as represented by the allocation of weight to each person within the social welfare function. The denominator accounts for both the direct and indirect costs associated with STW, notably how it influences behavioral changes. Ideally, the Marginal Value of Public Funds compares the effectiveness of STW expenditure against other strategies like employment subsidies or enhanced unemployment benefits. Empirical research on STW offers limited comparisons but sheds light on its impact on individual well-being and public spending.

⁷The willingness to pay of individual i for policy j is equal to her marginal utility associated with policy j divided by her marginal utility of income.

5.1 The social willingness to pay for STW

The social willingness to pay for STW depends on several factors which affect its impact on short-time workers but also those who do not use STW.

5.1.1 The impact on short-time users

People who retain their jobs thanks to STW generally have fewer income losses than those who lose them. The main reason is that STW allows workers to continue working whereas layoffs are most of the time associated with large drop in hours of work since it takes time to find a job. Job loss is also associated with a decrease in well-being, independent of the loss of income, which is reflected in a deterioration of physical and mental health. Companies that retain their employees thanks to STW avoid losing skills that contribute to improving their performance (Tilly & Niedermayer 2017). The social willingness to pay for STW, therefore, crucially depends on the number of jobs preserved, as highlighted by the seminal contribution of Burdett & Wright (1989). In this regard, it is essential to consider the jobs preserved for the short-time workers. The findings from empirical studies on this subject are examined below.

It is also essential to account for the institutional context. In countries where employment protection regulation is strict, significant income shocks to companies can lead them to bankruptcy if adjusting employment is too costly (Samaniego 2006, Koeniger & Prat 2007). This could ultimately result in a chain of bankruptcies and significant job losses. Under these circumstances, STW can be particularly effective in cushioning the impact of major shocks on employment and working hours. The strictness of employment protection increases the willingness to pay for STW even more, as it extends the duration of unemployment spells, thus making job losses more costly for employees. A labor contract regulation that restricts the possibility of renegotiating wages and working conditions can increase the social willingness to pay for STW, just as a financial system whose situation exacerbates companies' liquidity problems (Giroud & Mueller 2017).

Conversely, certain contexts limit the willingness to pay because insurance mechanisms provide services similar to those of STW. For example, the combination of temporary layoffs with an experience rating system that encourages companies to rehire workers reduces the unemployment duration and the income drop following job loss (Albertini et al. 2023). The Covid-19 pandemic in the United States provides a very good illustration of this example. Temporary layoffs constituted about

two-thirds of the decline in paid employment at the onset of the pandemic (Cajner et al. 2020). In this context, Hall & Kudlyak (2022) argue that understanding unemployment during the pandemic requires differentiating between those without jobs — ‘jobless unemployment’ — and those who, while still technically employed, are temporarily laid off and therefore not working — ‘temporary-layoff unemployment’. The recovery rate for temporary-layoff unemployment is much swifter than for jobless unemployment. The majority of those temporarily laid off are often recalled to their jobs, bypassing the lengthy search and matching process that typically slows recovery. According to Bell et al. (2021), among the claimants who entered the California UI system during the second quarter of 2020 and were fully separated from their employer, 51% of those who initially expected to be recalled and 30% of those who did not report they expected to be recalled were recalled to their prior employer by the end of 2020. Ganong et al. (2021) find that about 75 percent of unemployment exits reflected recall to a prior employer in May 2020.

The high rehiring rate for those on temporary layoff reduces the willingness to pay for STW. Moreover, the ability to combine partial unemployment benefits with income while being rehired by the same company and working fewer hours than before implies that an unemployment insurance system covering temporary layoffs and offering partial unemployment benefits provides coverage very similar to that of STW. The way unemployment insurance is financed also influences employers’ incentives to dismiss their employees and to recall them when they are unemployed: Albertini et al. (2023) estimate that the experience rating system for financing unemployment insurance in the United States significantly encourages employers to recall workers they have laid off. Therefore, the willingness to pay for STW must be assessed in light of the institutional context.

5.1.2 The impact on short-time non-users

It is also crucial to consider the situation of those who do not use STW, who can be affected. STW can have both positive and negative effects on the well-being of STW non-users. On one hand, by safeguarding jobs, STW can improve the well-being of non-users: the preservation of jobs for short-time users can benefit their family members and acquaintances (Hilger 2016, Britto et al. 2022); it can reduce criminality (Fougère et al. 2009, Draca & Machin 2015); STW can reduce future job loss risk for non-users who foresee benefiting from it in the future as shown in the analysis of job surplus in Section 4; STW can sustain aggregate demand which can benefit to STW non-users. On the other hand, although STW is essentially a mechanism that promotes job sharing, employees with stable employ-

ment generally benefit more than other workers. STW can then increase the difficulty for workers in unstable employment and the unemployed to find a job if it results in a reduction in hiring. The impact of STW on workforce turnover can also have consequences on productivity if it promotes the retention of the workforce in low performing firms. In these cases, the potentially positive impact on the well-being of short-time users on social welfare may be offset, in the medium to long term, by the reduction in job creation and productivity (Albertini et al. 2022, Cooper et al. 2017, Tilly & Niedermayer 2017). If such effects emerge, the social willingness to pay for STW may strongly depend on the weight of each individual in the social welfare function.

5.2 The Net public cost of STW

Examining the impact of STW on the Net public cost provides additional insight beyond its effects on the social willingness to pay, in particular on the fiscal externalities induced by the behavioral response to STW and its effectiveness at targeting jobs at risk of destruction.

5.2.1 Costs and benefits for public expenditure

First and foremost, job losses lead to social and fiscal repercussions that employers do not consider when they lay off workers. These externalities suggest that job losses are socially inefficient (Feldstein 1976, Blanchard & Tirole 2008, Cahuc & Zylberberg 2008). These externalities are multifaceted, encompassing unemployment benefits, social transfers provided to unemployed workers, and the decline in tax revenue and social contributions resulting from job losses. Additionally, there are indirect costs such as heightened healthcare expenses and spikes in crime associated with rising unemployment (Fougère et al. 2009, Draca & Machin 2015, Britto et al. 2022). Fiscal externalities are especially significant in contemporary welfare states with strong social protection.

For these reasons, STW can reduce fiscal expenditures if it preserves jobs. In principle, STW should reduce the Net public cost if it results in a decrease in job losses and an increase in total hours worked thanks to the preservation of jobs. However, STW can also encourage a reduction in working hours, since it subsidizes non-working hours (Burdett & Wright 1989). This behavioral effect increases the Net public cost. Therefore, in theory, STW can have both a positive and negative impact on public expenditure depending on its consequences on employment and hours worked.

For now, available studies do not provide consistent results regarding the sign of the fiscal externality due to behavioral effects, associated with ST. They likely depend on the design of STW. Giupponi &

Landais (2023) found a positive fiscal externality in Italy, suggesting that for every euro spent on short-time work, the total cost to the government, due to behavioral responses, is around Euro 1.38. Conversely, **Kopp & Siegenthaler (2021)** identified a negative fiscal externality in Switzerland, indicating that the policy is essentially self-financing, meaning that the behavioral response does not deteriorate public finances.

5.2.2 Effectiveness at targeting vulnerable jobs

Several empirical studies on the Covid-19 recession emphasize that subsidies to firms and wage subsidies, when not accurately targeted, are less effective than STW, given that STW serves as a screening mechanism – see Section 4. **Autor et al. (2022a)** and **Autor et al. (2022b)** analyze the consequences of the Paycheck Protection Program in the US, which distributed vast amounts of aid to small businesses to preserve jobs and provide liquidity. The estimated cost-per-job-saved by this program varies from \$169,000 to \$258,000, or to put it differently, from 3.4 to 5 times the median annual salary. They argue that this excessively high cost stems from poor targeting of the aid, and that preserving jobs and providing liquidity should be better served by addressing these issues directly and separately, thus enabling better targeting and a more progressive incidence. According to **Autor et al. (2022b)**, the job retention goal could be better achieved by relying on wage subsidy programs explicitly targeted to firms that had experienced declines in revenue and by STW. Other contributions share this point of view. **Smart et al. (2023)** evaluate the effects on workers and firms of the Canada Emergency Wage Subsidy (CEWS), which offered subsidies up to 85 percent of eligible payroll costs to virtually all private-sector employers, at a total fiscal cost of five percent of GDP in the first year of the pandemic. Their findings confirm those found by **Autor et al. (2022b)** in the US: much of the spending supported inframarginal jobs that would have existed in the absence of the subsidies. The estimated net wage elasticity of employment was -0.11 , implying a small aggregate employment effect of the program and an estimated fiscal cost per job saved of nearly \$200,000 per year. **Borland & Hunt (2023)** study the impact of the JobKeeper program on job losses and unemployment in Australia during the Covid-19 pandemic. The JobKeeper program was a government subsidy that was paid to employers to keep employees on their payroll during the pandemic. It was available to eligible businesses that experienced a decline in revenue of at least 30%. The subsidy covered 50% of an employee's wages up to a maximum of \$1,500 per fortnight. **Borland & Hunt (2023)** find that the program was effective in preventing job losses and reducing unemployment. The cost per saved job, estimated at approximately \$100,000 annually, was

less than that of the US Paycheck Protection Program. However, it is still relatively high. [Borland & Hunt \(2023\)](#) contend that with improved targeting of jobs at risk of destruction, STW could reduce this cost.

Overall, the Covid-19 pandemic has spotlighted the pressing need for effective job preservation strategies. The merits of STW as a screening tool, underscores its potential in reducing windfall effects and ensuring targeted support for the most vulnerable jobs. Yet, the effectiveness of job preservation strategies hinges on their execution, particularly the accuracy of administrative checks and the reduction of potential adverse selection and moral hazard.

The contribution of [Bossler et al. \(2023\)](#) who conducted a survey to evaluate the extent of free riding behaviors associated with STW in the Covid-19 pandemic in Germany, provides interesting information on this issue. They consider three specific types of misconduct reported by employees. *i.)* Exceeding STW allowance hours: some employees on STW can work more hours than declared in their STW allowance. This means that employers can exploit unemployment insurance by having employees work hours that are technically covered by STW payments. *ii.)* Unchanged workload: employees can report no reduction in their workload despite being on STW. This contradicts the fundamental premise of STW, which is meant for situations where there is a substantial reduction in work due to unforeseen circumstances. *iii.)* Dismissal announcements during STW: workers can be informed of their impending dismissal while still on STW. Although it is legal to dismiss employees post-STW, the scheme's primary objective is job preservation. It is not intended to merely extend the duration of unemployment benefits. [Bossler et al. \(2023\)](#) find that 17.6% of respondents reported working more hours than stated in their STW allowance, with estimates ranging from 14.3% to 22.1% depending on the methods and groups of STW workers surveyed. 38.3% indicated an unchanged workload while on STW, with estimates fluctuating between 36.1% and 42.2%. 4.3% stated that they had been informed of their job termination before beginning their STW period, with a range of 2.0% to 10.3%.

These results highlight the difficulty in verifying the accuracy of statements regarding working hours, which limits the effectiveness of STW, even in countries like Germany, where this scheme has been in place for nearly a century. They underscore the importance of rigorous monitoring and regulatory framework to ensure the integrity and effectiveness of STW schemes. They also suggest that STW is not always more effective than subsidies that are conditional on companies' performance indicators, especially when it comes to directing public aid towards companies at a higher risk of job losses. This likely depends on the context.

The analysis of the factors that determine the social willingness to pay and the net public cost of STW shows that the impact of STW on employment, working hours, and job reallocation plays a crucial role. The following sections present the results of empirical studies on these topics, first at the macroeconomic level, then from the firms' perspective, and finally from the workers' standpoint.

6 Effects of STW at the macroeconomic level

Studies that take a macroeconomic approach, utilizing data from various countries (as seen in works by [Abraham & Houseman \(1994\)](#), [Boeri & Bruecker \(2011\)](#), [Brey & Hertweck \(2020\)](#), [Cahuc & Carcillo \(2011\)](#), [Hijzen & Martin \(2013\)](#), [Van Audenrode \(1994\)](#)) or from different states within the United States ([Abraham & Houseman 2014](#)), have generally pointed towards a favorable influence of STW on employment by allowing for adjusting hours of work instead of employment.

6.1 STW before the Great recession of 2008-2009

The seminal contribution of [Abraham & Houseman \(1994\)](#) provided the first systematic, cross-country insights into the effects of short-time schemes. They questioned the prevailing notion that the increasingly stringent job security regulations of the 1970s and 1980s in European countries were significantly impeding the adjustment of total work hours in response to unforeseen shocks. They proposed that stringent job security regulations were typically complemented by measures designed to promote alternatives to layoffs, such as work-sharing. They sought to determine the degree to which variations in working hours could provide employers with a feasible alternative to layoffs. To this end, they examined patterns of aggregate adjustment in employment and hours worked across different countries and time periods, using quarterly time-series data from Belgium, France, Germany, and the United States.

Their findings revealed that the pace of employment adjustment in response to output changes was considerably slower in the manufacturing sectors of Germany, France, and Belgium compared to the United States. However, the adjustment of total hours worked (i.e., hours multiplied by employment) seemed to be similar in these countries. The adjustment of weekly hours was quicker in Belgium, France, and Germany, where STW programs were in place.

[Van Audenrode \(1994\)](#) corroborates these findings through his analysis of the adjustment of hours and employment across ten OECD countries from 1969 to 1988. His study reveals that five countries,

namely the United States, Belgium, Denmark, Italy, and Sweden, exhibit comparably rapid adjustments in total hours. Interestingly, in the four European nations, this swift adjustment in total hours occurs despite the pace of employment adjustments being significantly slower than in the United States. [Van Audenrode \(1994\)](#) attributes this to the more generous STW schemes in these European countries compared to the United States. As a result, he deduces that generous STW schemes contribute to work flexibility and promote rapid adjustment in total hours, even in the face of firing restrictions. However, he also posits that in countries with less generous or no STW schemes, working time is not flexible enough to offset the slower employment adjustments caused by firing restrictions. Despite this, he observes that in countries with robust job protection, overall labor adjustments manage to match the flexibility seen in the United States, as adjustments in working time compensate for firing restrictions.

6.2 STW in the Great recession of 2008-2009

Several empirical studies have confirmed the positive impact of STW on employment through an adjustment of working hours, found in previous contributions, during the Great recession of 2008-2009. Some of these studies obtain results from reduced-form econometric analyses while others are based on calibrated structural models or structural vector autoregressions. They provide interesting insights into the impact of STW depending on the economic situation, the nature of jobs saved thanks to STW, and potential issues posed by its implementation.

To overcome the selection issue associated with STW use, the studies relying on reduced-form analyses generally use indicators of past use of STW as instrumental variables for STW. However, these studies are often based on a limited set of observations, which restricts their capacity to establish a causal link between STW and employment. That said, it has been observed that STW played a role in stabilizing employment and curbing unemployment during the economic recession of 2008-2009 (as noted by [Boeri & Bruecker \(2011\)](#), [Cahuc & Carcillo \(2011\)](#), [Hijzen & Martin \(2013\)](#)). A rise of one percentage point in STW take-up rates approximately correlates with a one percentage point drop in unemployment and a similar increase in employment. Overall, these assessments imply that STW compensation schemes played a significant role in safeguarding jobs during the economic downturn. The most substantial impacts were observed in Germany and Japan, where STW helped preserve 0.7-0.8% of jobs during the recession.

These studies also reveal that the beneficial impact of STW on employment was confined to work-

ers with permanent contracts (Cahuc & Carcillo 2011, Hijzen & Martin 2013). This, in turn, amplified the labor market segmentation, widening the divide between workers in regular employment and those in temporary positions.

Furthermore, the employment effects of STW depend on the amplitude of the recession, as shown by Brey & Hertweck (2020), who find that STW saves more jobs when GDP growth is deeply negative. The timing of STW is also important: Hijzen & Martin (2013) estimate that the persistent application of STW during the recovery phase had an adverse effect on the job-content of the recovery. Consequently, they estimate that the net effect on employment significantly declined during the recovery, and in some countries, it even turned negative. By the last quarter of 2010, the cumulative employment impact of STW since the onset of the crisis was marginally negative in Germany (0.7%) and Italy (0.1%), and markedly negative in Japan (1.5%).

The results of reduced-form analyses are corroborated by structural models that take into account various factors, other than STW, that could influence employment and unemployment during the recession. This approach is particularly relevant in the case of Germany, where unemployment increased very little during the recession. The Hartz reforms and wage moderation that preceded the Great Recession could indeed have helped to mitigate the impact of the recession on employment (Dustmann et al. 2014, Rinne & Zimmermann 2013). Moreover, Burda & Hunt (2011) have demonstrated that the adjustment of working hours to maintain employment primarily occurs through institutional mechanisms in Germany, such as STW, but also includes working time accounts, overtime, or regular part-time work. Gehrke et al. (2019) estimate a general equilibrium model which disentangles the role of institutions (short-time work, government spending rules) and shocks (aggregate, labor market, and policy shocks). Balleer et al. (2016) identify the same types of factors with a structural vector autoregressive model. Both contributions confirm that STW played a significant role in preserving numerous jobs in Germany. However, the low-response of unemployment during the Great Recession cannot be solely attributed to STW. Other factors, particularly working time accounts and wage moderation, must have also been instrumental.

6.3 STW in the Covid-19 crisis

Many OECD countries used STW schemes as an instrument for securing jobs at unprecedented levels during the Covid-19 crisis. The impact of STW on employment in businesses closed for administrative reasons to halt the spread of the virus is evidently positive. From this perspective, the Covid-19 crisis

is very peculiar. Nevertheless, the currently available studies that address the Covid-19 crisis from a macroeconomic perspective shed light on two aspects: the stabilizing effect of STW on aggregate demand and the extent to which STW may have excessively reduced the number of hours worked.

[Dengler & Gehrke \(2022\)](#) construct a New Keynesian model, incorporating incomplete asset markets and labor market frictions. This model features both an endogenous firing decision and a short-time work decision, providing a framework to analyze the impact of STW on precautionary savings. They posit that during recessions, STW diminishes the unemployment risk for workers, thereby alleviating their motive for precautionary savings and causing less of a decline in aggregate demand. Their findings suggest that this mechanism can enhance the stabilization potential of short-time work over the business cycle by up to 55%, and even more so when monetary policy is constrained by the zero lower bound. Furthermore, they argue that an increase in the STW replacement rate can be more effective compared to an increase in the unemployment benefit replacement rate.

[Albertini et al. \(2022\)](#) build a dynamic model incorporating incomplete markets, search frictions, human capital, and both aggregate and idiosyncratic productivity shocks. This model is designed to capture the specific supply and demand effects of STW. Their study focuses on France, where STW covered up to 40% of wage earners and where the net replacement ratio was increased to 100% at the minimum wage and 84% for higher wages, up to a maximum of 4.5 times the minimum wage, covering more than 95% of wage earners. Their findings show that this highly generous STW scheme led to an increase in saving and wealth dispersion. In this context, in line with the predictions of the theoretical models discussed in Section 4, they also find that, while STW stabilized employment, it induced an excessive reduction in hours worked.

6.4 The role of the timing of STW regulation and eligibility criteria

In relation to the implementation of STW, [Brey & Hertweck \(2020\)](#) emphasize that the influence of STW on the unemployment rate wanes at higher take-up rates. This highlights the importance of eligibility criteria in preventing significant deadweight losses—i.e., subsidies paid for jobs that employers would have retained in the absence of the subsidy—during economic downturns. [Brey & Hertweck \(2020\)](#) also observe that the impact of STW is markedly less potent in countries with newly instituted STW schemes. The reduced effectiveness of new STW schemes may stem from the difficulties encountered by the administration in managing complex rules when it is not adequately prepared. This also suggests that workers and employers may require a period of adjustment to understand how to utilize

a fresh STW scheme, or that the roll-out of certain new STW schemes may have been insufficiently timely to avert the majority of layoffs during the Great Recession.

From a related perspective, [Balleer et al. \(2016\)](#) contend that while the rule-based component of STW serves as a cost-efficient safeguard for jobs, its discretionary component falls short of effectiveness to the extent that a discretionary relaxation of the STW eligibility criterion merely subsidizes jobs that would have survived even without the intervention. Their dynamic general equilibrium model, calibrated with data from Germany, provides a plausible explanation focusing on the forward-looking dimension of job value. Indeed, if discretionary interventions are temporary, firms' future expectations regarding the availability of STW support remain unchanged (i.e., the expected maximum value $\mathbb{E}[\max[S(A'), 0]]$ in the surplus equation (3) does not alter). As a result, the beneficial impact of STW on employment levels diminishes. Conversely, rules exert a direct influence on employment by impacting firms' hiring and firing decisions through future expectations. [Gehrke & Hochmuth \(2021\)](#) delve deeper into this matter, examining the effects of STW across the business cycle. They employ vector autoregressive models, estimated using German data. Their findings reveal that the impacts of discretionary STW policy exhibit significant fluctuations across the business cycle and that discretionary STW is not always ineffective. When implemented during recessions, discretionary STW bolsters employment, whereas its effect during expansions is negligible and could potentially become negative in the long term. When examining extreme events, particularly the Great Recession, the estimated effects are more pronounced and enduring. The number of jobs preserved per employee on STW due to discretionary policy reached its highest value during the Great Recession, with 0.87 jobs saved per discretionary short-time worker, but could potentially become negative during expansions, in line with the findings of [Hijzen & Martin \(2013\)](#).

7 Effects on firms

Contributions that scrutinize the impact of STW utilizing firm-level data provide a valuable supplement to macroeconomic analyses, given their access to a significantly larger pool of observations. Nonetheless, they also encounter a selection issue when attempting to identify a causal impact of STW, because STW users may inherently differ from non-users. Early studies endeavored to address this selection issue through propensity score matching, yielding results that were ambiguous and lacked robustness. [Kruppe & Scholz \(2014\)](#), utilizing German data, and [Kato & Kodama \(2019\)](#), utilizing

Japanese data, found no discernible effects of STW on employment. In France, [Calavrezo et al. \(2010\)](#) found that establishments authorized to use short-time work were more likely to declare bankruptcy. The remainder of this section presents the results of contributions that rely on other identification strategies.

7.1 Employment and hours of work

[Boeri & Bruecker \(2011\)](#), using prior experience of the firm with the program in Germany as an instrument for participation in STW, found positive effects of STW on employment. This empirical strategy represents an advancement over previous studies. However, as [Bellmann et al. \(2015\)](#) highlight, this identification strategy is potentially flawed since empirical evidence indicates that firms utilizing short-time work tend to adjust employment more drastically in response to output falls than firms not using STW. This behavior of STW users may be a result of technical constraints: firms are more incentivized to use short-time work if their production process implies higher costs to store production or more difficulties to find productive activities for incumbent employees when demand drops. Consequently, instrumenting program use with prior experience is likely to bias estimation of the impact of STW on employment.

Contributions that have leveraged variations in the approval rates of firms' STW applications ([Cahuc et al. 2021](#), [Kopp & Siegenthaler 2021](#)) or in the eligibility of firms ([Giupponi & Landais 2023](#), [Biancardi et al. 2022](#)) employ strategies better suited to address selection issues. They also lead to more convergent results, highlighting the positive impact of STW on the preservation of employment during the Great Recession of 2008-2009.

[Kopp & Siegenthaler \(2021\)](#) employ a difference-in-differences strategy, comparing changes in outcomes for establishments in Switzerland that successfully applied for STW with those whose applications were denied. Establishments with denied applications and untreated establishments are matched to treated establishments based on nearest-neighbor propensity score matching. They document that changes in outcomes for establishments whose STW applications were denied provide a valid counterfactual for changes in outcomes for establishments whose STW applications were approved. Their findings suggest that the approval of STW leads to a cumulative reduction in permanent layoffs into unemployment of at least 10% of an establishment's workforce three years post-application. Notably, the effect of STW on dismissals extends beyond the period during which treated establishments receive STW benefits, indicating that STW permanently prevents dismissals rather

than merely postponing them. STW increased full-time equivalent employment by 9%–17% 4.5 years post-application. The STW program primarily preserves jobs of workers with lower educational attainment. Overall, their findings suggest that the Swiss STW scheme preserved 0.19–0.36 full-time jobs for every worker in the program. They also estimate that the program’s direct fiscal benefits, which arise in the form of a reduction in spending on unemployment benefits, may have been almost large enough to offset the total fiscal spending on STW benefits.

Giupponi & Landais (2023) employ an identification strategy that leverages the variation in eligibility rules related to the industry and size of Italian firms. They find that STW has substantial and significant effects on firms’ employment and working hours. Compared to their counterfactual counterparts, firms treated with STW experience a 40% reduction in hours worked per employee, and a similar magnitude increase in the number of employees in the firm, with no apparent effect on wage rates. The employment effects are driven by a modest positive effect on inflows and a substantial negative effect on outflows. The positive employment effects are primarily driven by an increase in the number of employees on open-ended contracts. Conversely, the number of employees on fixed-term contracts experiences a negative impact. This supports the notion that STW treatment interacts with labor market duality, thereby shifting the structure of employment towards open-ended contracts. Furthermore, in contrast to the findings of **Kopp & Siegenthaler (2021)** in Switzerland, Giupponi and Landais do not observe a sustained employment impact of STW in Italy once its usage stops. This might be the consequence of the longer recession in Italy.

The beneficial impact on employment is primarily attributed to a decrease in layoffs according to **Kopp & Siegenthaler (2021)** and **Giupponi & Landais (2023)**. However, Kopp and Siegenthaler find that STW also reduces hiring, while **Giupponi & Landais (2023)** find a small increase in hiring.

Cahuc et al. (2021) introduce a model that elucidates the conditions under which STW programs can preserve employment. Specifically, their analysis reveals that STW is effective in safeguarding jobs within firms subjected to significant negative revenue shocks. Conversely, in firms with less severe impacts, the model demonstrates that STW leads to a reduction in hours worked without necessarily preserving employment. This concept is detailed in the model discussed previously in Section 4.2, highlighting that STW’s ability to reduce work hours does not guarantee job preservation, especially when the firm’s productivity parameter exceeds the threshold of reservation productivity in the absence of STW use. Their identification strategy, applied with French administrative data during the Great Recession, hinges on variations in local approval rate interacted with a local measure of the size

of the revenue shock impacting each firm. They uncover no statistically significant positive impact of STW on total employment in 2009, with only minor positive effects appearing by 2011. STW notably curtails the total number of work hours. However, for firms grappling with the most significant revenue declines, STW exerts a positive influence on both employment and working hours. This effect was observed in 2009, during the recession, and lasted at least until 2011. These firms affected by large negative revenue shocks have been able to recover rapidly in the aftermath of the Recession, thanks to STW. STW does not preserve employment in other firms and reduces their working hours. From a related perspective, [Tracey & Polachek \(2020\)](#), find that cyclically sensitive firms have about 14% lower layoff rates when they use STW, but find no difference for more cyclically stable firms.

[Biancardi et al. \(2022\)](#) point to another source of heterogeneity of the impact of STW on firms, by showing that the impact of STW on Italian companies is influenced by the presence of unions. They find a greater downward sensitivity of working hours per employee to STW in highly unionized firms compared to those with low unionization. If local union density is interpreted as a proxy for union power, these results align with the notion of strong unions advocating for the use of STW as a work-sharing device to safeguard employment of incumbent workers, who are predominantly union members. These effects, however, are temporary and dissipate within two years, once the legal duration of STW schemes is reached.

Overall, these studies converge to observe that STW preserves employment, particularly in companies facing significant negative shocks. However, the results are more uncertain regarding the duration of these effects. It seems that these effects persist several years after the end of the scheme in France and Switzerland, while they disappear quickly in Italy. The same observation applies to working hours, whose evolution seems strongly linked to the context, and more specifically to the magnitude of the revenue shock ([Cahuc et al. 2021](#)) and the bargaining power of unions ([Biancardi et al. 2022](#)).

7.2 Firm productivity, profitability and firm survival

By reducing the average number of hours worked per employee within the firm, STW clearly decreases the average productivity of workers. Beyond this effect, the impact of STW on the productivity and profitability of firms depends on the balance of power between employee representatives and employers, given that collective negotiations are generally required prior to the implementation of STW. The influence of workers' representatives extends beyond the mere adoption of STW, potentially impacting firm performance as well. They may advocate for a more substantial reduction in per-capita

working hours as a strategy to prevent significant employment losses. Furthermore, they may engage in negotiations over wages, the selection of short-time workers, and working conditions. This includes factors such as working hours, task organization, and other forms of internal flexibility. Although these numerous factors may influence labor productivity during periods when companies adopt STW, the available results, in Italy, do not show any impact of STW on hourly productivity (Biancardi et al. 2022, Giupponi & Landais 2023).

For the reasons we have just mentioned, the impact of STW on firm profitability depends on the institutional context. In Italy, Biancardi et al. (2022) find that STW has a negative impact on the return on assets (ROA). They also observe that a higher union density is associated with a greater reduction in working hours and a smaller decrease in wages in companies that use STW, which should have a negative impact on their profitability. In return, higher union density can facilitate cooperation within the company, which can improve the profitability of companies that use STW. These two “faces of unions” – monopoly power and voice – highlighted by Freeman & Medoff (1984), may explain why Biancardi et al. (2022) find that higher union density is not associated with a greater decrease in the profitability of companies that use STW, even though it results in higher wages and fewer working hours.

The importance of the institutional context is also highlighted in Kato & Kodama (2019) who argue that sharing jobs thanks to STW, by distributing the burden among employees, helps them collectively overcome adversity, thus fostering supportive interactions among colleagues. This, in turn, can strengthen the alignment of goals between workers and the firm. Goal alignment facilitates the implementation of strategic changes aimed at enhancing performance. This viewpoint suggesting that STW is more equitable because it operates as a work-sharing scheme that spreads the burden of adjustment across a larger group of workers by reducing their work hours, as opposed to situations where certain workers are abruptly let go has also been put forward, among others, by Abraham & Houseman (1994), Walsh et al. (1997), Vroman & Brusentsev (2009). This holds especially true when STW is put into effect as part of ‘solidarity agreements’ that aim to prevent layoffs. The findings of Kato & Kodama (2019) obtained by combining propensity score matching with a difference-in-differences estimation for Japanese firms over the period 2008-2014 are consistent with this interpretation. They find that STW has a positive impact on sales and Return on Assets for companies that have implemented STW.

One can expect the effects of STW on firms’ survival to be positive, given that they benefit from subsidies to adjust working hours and save on dismissal costs. However, the impact may be influenced

by the quality of labor relations and the power balance between employers and employees. Indeed, STW has a positive impact on firm survival in Switzerland (Kopp & Siegenthaler 2021) and Italy (Giupponi & Landais 2023). Cahuc et al. (2021) do not find a significant impact in France, which may be a consequence of their sample selection that excludes all companies with less than 5 employees.

7.3 Job reallocation and productivity

Given that STW is a form of job protection that leads to workforce retention and can reduce worker reallocation from low to high productive firms, it is possible that STW decreases productivity. First, there is ample empirical evidence indicating that job protection affects the allocation of resources among industries, existing firms, and different groups of workers, as well as the intensity of firm creation and destruction. The impact of job protection on job reallocation has implications for productivity, as it affects the movement of jobs from low-productivity to high-productivity industries and firms. Empirical studies have found that the negative impact of job protection on job reallocation decreases total factor productivity (Cahuc & Palladino 2024). Secondly, companies that adopt STW practices are generally less productive and less profitable. Therefore, STW is likely to confine workers within less productive firms.

The study conducted by Giupponi & Landais (2023) on Italian firms provides valuable insights into the impact of STW on the process of reallocation. Their findings indicate that STW tends to subsidize persistently low productivity matches, as less productive firms exhibit a propensity to opt for STW arrangements. Additionally, they utilized variations across local labor markets to assess the association between (exogenously) higher exposure to STW and the employment growth of high productivity firms. Notably, they observed a significant negative correlation, suggesting that in labor markets with greater accessibility to STW for low productivity firms, high productivity firms encounter greater challenges in achieving employment growth. This finding supports the notion that STW can impede the process of reallocation. However, the magnitude of the estimated effects remains relatively small despite the clear evidence of STW's influence on reallocation dynamics.

Cooper et al. (2017) examine the impact of STW during the Great Recession using a search and matching model that incorporates heterogeneous firms, calibrated on German data. The recession is represented by an aggregate shock that induces the least productive firms to intensify the use of STW, in line with empirical findings. The labor retention associated with STW significantly dampens the impact of the recession on unemployment. However, it exacerbates labor market tightness, leading

to recruitment difficulties and reduced job creation for firms that, on average, are more productive than those that utilized STW. The negative impact of STW on job creation persists for several years. [Cooper et al. \(2017\)](#) estimate that STW has reduced GDP, but this is mainly attributed to the decrease in working hours. The decrease in labor reallocation associated with STW is quantitatively marginal.

8 Effects on workers trajectories

The limited number of studies examining the impact of STW on workers' trajectories grapple with the challenge of identifying a suitable counterfactual for STW beneficiaries. The difficulty in finding a relevant counterfactual stems from the fact that generally not all workers in an establishment using STW are short-time users. Typically, the selection of workers to be included in the STW scheme is a decision made collaboratively by employers and workers' representatives. Thus, workers are subject to STW following a dual selection process: the selection of the establishment and the selection of workers within the establishment.

[Tilly & Niedermayer \(2017\)](#) exploit German administrative data over the period 2009-2011 and show that STW take-up is increasing in experience and tenure after accounting for a large number of other observables. They examine the trajectories of individuals employed full-time in January 2009 with at least six months of tenure in their current job and compare how full-time employment and earnings evolve in response to an initial transition into either STW or unemployment. The vast majority of short-time workers return to full-time work with their current employer. Short-time workers do not experience long-term effects on earnings or employment. In contrast, laid off workers experience a long-term loss in earnings and this loss is largest for workers who are experienced and have high tenure at the time of the layoff. These results are interesting. However, comparing short-time workers with those who have been laid off yields limited insights into the effects of STW, given that not all short-time workers would have faced layoffs in the absence of STW.

[Pavlopoulos & Chkalova \(2022\)](#) delve into the employment impact of STW in the Netherlands during the Great Recession (2009–2011). They compare short-time workers from firms that utilized STW with workers from firms that did not engage with STW. The selection of firms that use STW is accounted for by incorporating covariates such as the firm's revenue change, economic sector, and firm size. Their findings suggest that STW mitigated the risk of unemployment and job separation. The effectiveness of STW in safeguarding workers from unemployment was most pronounced in firms that

extended the use of the program to a large number of workers for a relatively small number of hours.

Giupponi & Landais (2023) compare the trajectories of Italian short-time workers from firms that utilized STW, with two types of workers: i) workers from firms that were not eligible to STW, ii) laid off workers from firms that were not eligible to STW. Workers from firms not eligible for STW exhibit a similar employment probability to that of short-time workers in the first year, but higher work hours and income in the subsequent four years. This arises because firms utilizing STW are, on average, less productive than the entirety of firms not eligible for STW. The employment probability, income, and work hours of laid-off workers are lower the first year. The employment probability of short-time users and laid-off workers converges to become identical after four years. But the income and work hours of laid-off workers remain slightly lower at this horizon.

Unlike previous contributions, **Arranz et al. (2018)** do not study the impact of transitioning to STW, but rather the consequences of an increase in the generosity of STW for short-time workers. In March 2009, about one year after the onset of the Great Recession, the Spanish government increased the financial incentives provided to employers and employees for the reduction of working time. The impact of this reform is analyzed using a difference-in-differences estimation, comparing the trajectories of short-time workers and non-short-time users before and after the reform. The impact on employment probability is estimated to be null in the short run (after one year) for the group of participants and negative in the medium run (after two to three years), suggesting that increasing the generosity of STW may delay workers' transition to more productive companies.

9 Conclusion

The literature review on STW underscores its effectiveness as a job preservation mechanism. STW is notably efficacious in mitigating employment reductions during economic downturns within countries where rigid employment protections preclude significant job cuts without potentially bankrupting numerous firms, thereby intensifying the crisis. Nevertheless, the literature's insights remain constrained on critical aspects.

The interplay between STW and unemployment insurance is conceptually nebulous. The integration of STW into an optimal unemployment insurance framework *à la* **Baily (1978)**, to examine the optimal distribution between unemployment benefits and STW, if possible with sufficient statistics to leverage the data, would be very relevant. However, this integration introduces substantial theoretic-

cal challenges, especially in incorporating work hours and contract termination effects. Despite these hurdles, such integration is pivotal for formulating effective policies.

Empirically, the effects of STW on employment and work hours are underexplored. Research is scant on firms and workers responses to STW scheme features. A key inquiry is the consequences of financial contributions by firms and workers. A system that extensively remunerates employees for idle hours without corporate financial input may strain public finances and subsidize otherwise sustainable jobs. On the contrary, a less generous system might have negligible impact on job loss. Enhancing our comprehension of these effects is key. Additionally, future studies should elucidate STW's influence on workforce reallocation.

10 Bibliography

- Abraham, K. G. & Houseman, S. N. (2014), 'Short-time compensation as a tool to mitigate job loss? evidence on the U.S. experience during the recent recession', *Industrial Relations: A Journal of Economy and Society* **53**(4), 543–567.
- Abraham, K. & Houseman, S. (1994), Does employment protection inhibit labor market flexibility? lessons from Germany, France, and Belgium, *in* 'Social Protection versus Economic Flexibility: Is There a Trade-Off?', National Bureau of Economic Research, Inc, pp. 59–94.
- Adams-Prassl, A., Boneva, T., Golin, M. & Rauh, C. (2020), 'Furloughing', *Fiscal Studies* **41**(3), 591–622.
- Albertini, J., Fairise, X., Poirier, A. & Terriau, A. (2022), 'Short-time work policies during the covid-19 pandemic', *Annals of Economics and Statistics* (146), 123–172.
- Albertini, J., Fairise, X. & Terriau, A. (2023), 'Unemployment insurance, recalls, and experience rating', *Journal of Macroeconomics* **75**, 103482.
- Arranz, J. M., García-Serrano, C. & Hernanz, V. (2018), 'Short-time work and employment stability: Evidence from a policy change', *British Journal of Industrial Relations* **56**, 189–222.
- Autor, D., Cho, D., Crane, L. D., Goldar, M., Lutz, B., Montes, J., Peterman, W. B., Ratner, D., Villar, D. & Yildirmaz, A. (2022a), 'The \$800 billion paycheck protection program: Where did the money go and why did it go there?', *Journal of Economic Perspectives* **36**(2), 55–80.
- Autor, D., Cho, D., Crane, L. D., Goldar, M., Lutz, B., Montes, J., Peterman, W. B., Ratner, D., Villar, D. & Yildirmaz, A. (2022b), 'An evaluation of the paycheck protection program using administrative payroll microdata', *Journal of Public Economics* **211**, 104664.
- Baily, M. (1978), 'Some aspects of optimal unemployment insurance', *Journal of Public Economics* **10**(3), 379–402.
- Balleer, A., Gehrke, B., Lechthaler, W. & Merkl, C. (2016), 'Does short-time work save jobs? a business cycle analysis', *European Economic Review* **84**, 99–122. European Labor Market Issues.
- Bell, A., Hedin, T. J., Schnorr, G. & von Wachter, T. (2021), An analysis of unemployment insurance claims in california during the covid-19 pandemic, Policy Report 2021-19, California Policy Lab.

- Bellmann, L., Gerner, H.-D. & Upward, R. (2015), The response of german establishments to the 2008-2009 economic crisis, *in* P. Commendatore, S. Kayam & I. Kubin, eds, 'Complexity and Geographical Economics: Topics and Tools', Vol. 19, Springer, pp. 165–207.
- Bermudez, N., Dejemeppe, M. & Tarullo, G. (2023), 'Theory and empirics of short-time work: A review', *LIDAM Discussion Paper IRES* **2023**(18). Funding information: We acknowledge funding from the Belgian Federal Administration Science Policy within the program "BRAIN-be 2.0 (2020-2025)" (contract No. B2/202/P3) and from the Research Foundation – Flanders (FWO) (FWO project number: G010421N).
- Biancardi, D., Lucifora, C. & Origo, F. (2022), 'Short-time work and unionization', *Labour Economics* **78**, 102188.
- Blanchard, O. J. & Tirole, J. (2008), 'The joint design of unemployment insurance and employment protection: A first pass', *Journal of the European Economic Association* **6**(1), 45–77.
- Boeri, T. & Bruecker, H. (2011), 'Short-time work benefits revisited: some lessons from the Great Recession', *Economic Policy* **26**(68), 699–765.
- Boeri, T. & Cahuc, P. (2023), 'Labor market insurance policies in the twenty-first century', *Annual Review of Economics* **15**(10), 2003–2019.
- Borland, J. & Hunt, J. (2023), 'JobKeeper: An initial assessment', *Australian Economic Review* **56**(1), 109–123.
- Bossler, M., Osiander, C., Schmidtke, J. & Trappmann, M. (2023), 'Free riding on short-time work allowances? Results from an experimental survey design', *Kyklos* p. 1–20.
- Brey, B. & Hertweck, M. S. (2020), 'The extension of short-time work schemes during the Great Recession: A story of success?', *Macroeconomic Dynamics* **24**(2), 360–402.
- Britto, D. G. C., Pinotti, P. & Sampaio, B. (2022), 'The effect of job loss and unemployment insurance on crime in Brazil', *Econometrica* **90**(4), 1393–1423.
- Burda, M. & Hunt, J. (2011), 'What explains the german labor market miracle in the great recession?', *Brookings Papers on Economic Activity* pp. 273–319.

- Burdett, K. & Wright, R. (1989), 'Unemployment insurance and short-time compensation: The effects on layoffs, hours per worker, and wages', *Journal of Political Economy* **97**(6), 1479–1496.
- Cahuc, P. & Carcillo, S. (2011), 'Is Short-Time Work a Good Method to Keep Unemployment Down', *Nordic Economic Policy Review* **1**(1), 133–65.
- Cahuc, P., Kramarz, F. & Nevoux, S. (2021), The heterogeneous impact of short-time work: From saved jobs to windfall effects, Discussion paper 16168, IZA.
- Cahuc, P. & Nevoux, S. (2018), The inefficiency of regular reliance on short-time work, Policy Brief 33, Institut des Politiques Publiques, Paris, France.
- Cahuc, P. & Palladino, M. G. (2024), Employment protection legislation and job reallocation across sectors, firms, and workers: A survey, IZA Discussion Paper 16747, IZA – Institute of Labor Economics.
- Cahuc, P. & Zylberberg, A. (2008), 'Optimum income taxation and layoff taxes', *Journal of Public Economics* **92**(10), 2003–2019.
- Cajner, T., Crane, L. D., Decker, R. A., Adrian, Hamins-Puertolas & Kurz, C. (2020), Tracking labor market developments during the covid-19 pandemic: A preliminary assessment, Working paper, FEDS.
- Calavrezo, O., Duhautois, R. & Walkowiak, E. (2010), Short-time compensation and establishment exit: an empirical analysis with French data, IZA Discussion Papers 268, IZA Institute of Labor Economics.
- Cooper, R., Meyer, M. & Schott, I. (2017), The employment and output effects of short-time work in germany, NBER Working Paper 23688, National Bureau of Economic Research.
- Dengler, T. & Gehrke, B. (2022), Short-time work and precautionary savings, CESifo Working Paper 9873, Center for Economic Studies and ifo Institute (CESifo).
- Diaz, A., Dolado, J. J., Jáñez, Á. & Wellschmied, F. (2023), Labour market reallocation effects of covid-19 policies in Spain: A tale of two recessions, IZA Discussion Papers 16095, IZA Institute of Labor Economics.
- Draca, M. & Machin, S. (2015), 'Crime and economic incentives', *Annual Review of Economics* **7**(Volume 7, 2015), 389–408.

- Dustmann, C., Fitzenberger, B., Schönberg, U. & Spitz-Oener, A. (2014), 'From sick man of Europe to economic superstar: Germany's resurgent economy', *Journal of Economic Perspectives* **28**(1), 167–188.
- Feldstein, M. (1976), 'Temporary layoffs in the theory of unemployment', *Journal of Political Economy* **84**(5), 937–957.
- Fougère, D., Pouget, J. & Kramarz, F. (2009), 'Youth unemployment and crime in France', *Journal of the European Economic Association* **7**(5), 909–938.
- Freeman, R. B. & Medoff, J. L. (1984), *What Do Unions Do?*, Basic Books, New York, NY.
- Ganong, P., Greig, F., Noel, P., Sullivan, D. M. & Vavra, J. S. (2021), Spending and job search impacts of expanded unemployment benefits: Evidence from administrative micro data, Working Paper 2021-19, Becker Friedman Institute for Research In Economics.
- Gehrke, B. & Hochmuth, B. (2021), 'Counteracting unemployment in crises: Non-linear effects of short-time work policy', *Scandinavian Journal of Economics* **123**(1), 144–183.
- Gehrke, B., Lechthaler, W. & Merkl, C. (2019), 'The German labor market during the Great Recession: Shocks and institutions', *Economic Modelling* **78**, 192–208.
- Giroud, X. & Mueller, H. M. (2017), 'Firm Leverage, Consumer Demand, and Employment Losses During the Great Recession*', *The Quarterly Journal of Economics* **132**(1), 271–316.
- Giupponi, G. & Landais, C. (2023), 'Subsidizing Labour Hoarding in Recessions: The Employment and Welfare Effects of Short-time Work', *The Review of Economic Studies* **90**(4), 1963–2005.
- Giupponi, G., Landais, C. & Lapeyre, A. (2022), 'Should we insure workers or jobs during recessions?', *Journal of Economic Perspectives* **36**(2), 29–54.
- Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S. & Tatlow, H. (2021), 'A global panel database of pandemic policies (oxford covid-19 government response tracker)', *Nature Human Behaviour* **5**, 529–538.
- Hall, R. E. & Kudlyak, M. (2022), 'The unemployed with jobs and without jobs', *Labour Economics* **79**, 102244.

- Hendren, N. (2016), 'The policy elasticity', *Tax Policy and the Economy* **30**.
- Hendren, N. & Sprung-Keyser, B. (2020), 'A unified welfare analysis of government policies', *Quarterly Journal of Economics* **135**(3), 1209–1318.
- Hijzen, A. & Martin, S. (2013), 'The role of short-time work schemes during the global financial crisis and early recovery: a cross-country analysis', *IZA Journal of Labor Policy* **2**(5).
- Hijzen, A. & Salvatori, A. (2022), The impact of the covid-19 crisis across different socio-economic groups and the role of job retention schemes - the case of switzerland, OECD Working Papers 268, OECD Social, Employment and Migration Working Papers.
- Hijzen, A. & Venn, D. (2011), The role of short-time work schemes during the 2008-09 recession, Working Paper 115, OECD Social, Employment Migration Working Paper.
- Hilger, N. G. (2016), 'Parental job loss and children's long-term outcomes: Evidence from 7 million fathers' layoffs', *American Economic Journal: Applied Economics* **8**(3), 247–83.
- Kato, T. & Kodama, N. (2019), The consequences of short-time compensation: Evidence from japan, Technical report, IZA Discussion Paper, n°12596.
- Koeniger, W. & Prat, J. (2007), 'Employment protection, product market regulation and firm selection*', *The Economic Journal* **117**(521), F302–F332.
- Kopp, D. & Siegenthaler, M. (2021), 'Short-Time Work and Unemployment in and after the Great Recession', *Journal of the European Economic Association* **19**(4), 2283–2321.
- Kruppe, T. & Scholz, T. (2014), Labour hoarding in germany: employment effects of short-time work during the crises, Technical report, Discussion Paper 17, Institute for Employment Research (IAB).
- Lydon, R., Mathä, T. Y. & Millard, S. (2019), 'Short-time work in the Great Recession: firm-level evidence from 20 EU countries', *IZA Journal of Labor Policy* **8**(2).
- Mortensen, D. T. & Pissarides, C. A. (1994), 'Job creation and job destruction in the theory of unemployment', *The Review of Economic Studies* **61**(3), 397–415.
- OECD (2021), Job retention schemes during the covid-19 crisis: Promoting job retention while supporting job creation, in 'OECD Employment Outlook 2021: Navigating the COVID-19 Crisis and Recovery', OECD Publishing, Paris, pp. 100–150.

- Pavlopoulos, D. & Chkalova, K. (2022), 'Short-time work: A bridge to employment security or a springboard to unemployment?', *Economic and Industrial Democracy* **43**(1), 168–197.
- Rinne, U. & Zimmermann, K. (2013), 'Is Germany the North Star of labor market policy?', *IMF Economic Review* **61**(4), 702–729.
- Rosen, S. (1985), 'Implicit contracts: A survey', *Journal of Economic Literature* **23**(3), 1144–1175.
- Samaniego, R. M. (2006), 'Do firing costs affect the incidence of firm bankruptcy?', *Macroeconomic Dynamics* **10**(4), 467–501.
- Smart, M., Kronberg, M., Lesica, J., Leung, D. & Liu, H. (2023), The employment effects of a pandemic wage subsidy, Working Paper 10218, CESifo.
- Teichgräber, J., Žužek, S. & Hensel, J. (2022), Optimal short-time work: Screening for jobs at risk, Working Paper 402, University of Zurich Department of Economics.
- Tilly, J. & Niedermayer, K. (2017), Employment and welfare effects of short-time work, Unpublished.
- Tracey, M. R. & Polachek, S. W. (2020), 'Heterogeneous layoff effects of the us short-time compensation program', *LABOUR* **34**(4), 399–426.
- Van Audenrode, M. A. (1994), 'Short-time compensation, job security, and employment contracts: Evidence from selected OECD countries', *Journal of Political Economy* **102**(1), 76–102.
- Vroman, W. & Brusentsev, V. (2009), Short-time compensation as a policy to stabilize employment. University of Delaware, November 2009, manuscript.
- Walsh, S., London, R., McCanne, D., Needels, K., Nicholson, W. & Kerachsky, S. (1997), Evaluation of short-time compensation programs, Technical report, Final Report for the U.S. Department of Labor, March 1997, Berkeley Planning Associates / Mathematica Policy Research Inc.